PROCEEDINGS

OF THE

SECOND ANNUAL MEETING

OF THE

NORTH CENTRAL STATES WEED CONTROL CONFERENCE

SAINT PAUL, MINNESOTA

November 26 - 28, 1945

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ST. PAUL, MINNESOTA

NOVEMBER 26 - 28, 1945

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PREFACE

Included herein are all the main proceedings of the North Central States Weed Conference held at the Lowry Hotel, St. Paul, Minnesota, November 26 - 28, 1945.

Some material and remarks not directly pertaining to the technical work and parliamentary proceedings of the Conference have been briefed or in a few cases eliminated in the interest of brevity.

Editing otherwise was confined to obvious ommissions and errors in capitalization, spelling and use of scientific names in an attempt to harmonize all material.

A complete verbatim copy of the proceedings is on file with the Secretary-treasurer should any question arise concerning the proceedings.

The appreciation and thanks of all members and registrants of the Conference go to the following firms and individuals who so generiously contributed to financing the Conference and publishing the proceedings.

Twin City Seed Co.	Minneapolis, Minn.
Thompson Chemical Co.	Los Angeles, Calif.
Minnesota Farm Bureau Service Co.	St. Paul, Minn.
Chipman Chemical Co., Inc.	Bound Brook, N. J.
E. S. Gandrud	Owatonna, Minn.
Northrup King & Co.	Minneapolis, Minn
Cargill, Inc.	Minneapolis, Minn.
Jack Hyland	Chicago, Ill.
Minnesota Seed Dealers Ass'n.	Minneapolis, Minn.
C. B. Lyon & Bros., Inc.	St. Paul, Minn.
Oldbury Electro Chemical Co.	Niagara Falls, N. Y.
Land O'Lakes Creameries, Inc.	Minneapolis, Minn.
General Mills, Inc.	Minneapolis, Minn.
F. H. Peavey & Co.	Minneapolis, Minn.
National Aluminate Corp.	Chicago, Ill.
International Elevator Co.	Minneapolis, Minn.

Local arrangements for the Conference were handled largely by O. A. Ulvin for the Committee which included also A. H. Larson and C. H. Schrader, chairman.

A. H. Larson
Secretary-treasurer

St. Paul, Minnesota
March 25, 1946

SECOND ANNUAL MEETING
NORTH CENTRAL STATES WEED CONTROL CONFERENCE
SPANISH ROOM, HOTEL LOWRY
ST. PAUL, MINNESOTA
NOVEMBER 26, 27 and 28, 1945

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SECOND ANNUAL MEETING

NORTH CENTRAL STATES WEED CONTROL CONFERENCE

The Monday Afternoon Session of the Second Annual Meeting of the North Central States Weed Control Conference was held in the Spanish Room of the Hotel Lowry, St. Paul, Minnesota. The conference was called to order at 1:55 P.M on Monday, November 26, 1945, by Mr. T. F. Yost, President.

PRESIDENT YOST: The meeting will please come to order. We are certainly pleased to see such a nice turn-out. It seems to me from the large attendance that we will have an exceptionally fine meeting, and we certainly are glad to see such a good crowd and to see each and everyone of you, here.

The first meeting of the conference, as you all know, was held a little over a year ago at Omaha, Nebraska. This was, as everyone thought, a very successful meeting. Those of you that were there will remember that Mr. Leonard of Illinois was present at that meeting and acted as Chairman of one of the sessions. Probably most of you know that Mr. Leonard has passed away since that date. In respect to Mr. Leonard, I wonder if you would all stand and bow in silence in respect to his memory. (All present rose in silence in respect to the memory of Mr. Leonard.)

The Minnesota delegation, which has done so much in getting ready for this meeting, has kindly arranged for taking notes by a professional stenotype reporter. Any proceedings of the meeting will be taken down, and Mr. Hanson has agreed to sit on her right, and give her any assistance. When any of you speak, please speak up and give your name so that we can get a good record of everything that transpires at the meeting and turn out a good report for everyone.

We will now have the Address of Welcome by Commissioner R. A. Trovatten of the State Department of Agriculture. I have been informed that he has gotten out of bed to come to this meeting, so naturally, he will not be able to stay with us continuously. We appreciate the fact that he has been so interested in this meeting that he would come up to give us our address of welcome.

ADDRESS OF WELCOME, COMMISSIONER R. A. TROVATTEN, MINNESOTA

Chairman Yost, Vice President Hanson, and members of the conference. Let me, at the outset, welcome you here to the State of Minnesota. I think without any question, this is one of the important conferences dealing with Agricultural problems. The weed problem in this, and other States, naturally is one of the most insurmountable problems so far as Agriculture is concerned.

You have your scientists and research men from the Federal Department, at this conference, and I think it is fitting that you are all here. If we are going to deal with this vexing problem, naturally, we will have to work together in the best cooperation that can be put forth.

This is an important conference. I understand that you represent thirteen states. Why you picked out thirteen states, I don't know. It means, probably that you are not afraid of the number thirteen. Whether you selected the thirteen states because of the importance in the North Central portion of the nation as Agricultural States, I do not know, but it might be interesting for you people to realize for a minute, that the thirteen states, here represented, produce about 75 percent of the food of the nation. I think that is very important. When I say that the problems that you are dealing with are important, that is absolutely true, and when I see you people coming from a long distance, under the present congested system of traveling, it is very encouraging. Agriculture hasn't received a great deal of encouragement, and you scientists, particularly, have entered the field of agricultural scientists because you felt that it was a great field to enter into, not that you received the encouragement that you probably would have received in many of the other fields of science.

I was talking with the Governor just the other day, and he remarked about the fact that very little, if any, encouragement was given to young men and young women nowadays, to enter the field of agricultural research work. I think that is true. In practically every other science field, people are encouraged through subsidies,

endowments, etc., to do work that is necessary in the research field. But this is not so in agriculture--and not so in the particular work that you are dealing with here.

I hope that the time will soon be here, when private industry and the states, and nation, will devote more funds and give more encouragement to the people who are willing to enter the field of research, in your particular line. I think it is entirely neglected, and so it is encouraging to see people like you, willing to come out here and front for the industry that is so important in this nation.

The agricultural industry is important in this nation. I think it is by far the most important industry that we have. When we talk about the automotive industry, for instance, realizing that agriculture is about twenty times as large as all the combined automotive industries in the nation, we can then realize what a tremendous work you have here before you. Your work is very important and I know that you will treat it as important as it is. I hope that you will get a lot of encouragement from those that you have to work with in the future. This is, more or less, a new organization, having only met one session before. I know as time goes on, from year to year, this conference will become more and more important as you continue to meet. I hope that you will receive that encouragement from the people that should give agriculture the encouragement that it should have.

We, in the State of Minnesota, have no key to offer you people when you come here to St. Paul. I understand St. Paul never did have a key. It has always been an open city. I don't know whether you enjoy an open city, but I want to say that we have people in the department that are experienced in practically all branches, not only in agriculture, so if you need any entertainment outside of your conference, I know that we shall be more than pleased to offer you any assistance that you can ask for. If you should encounter the police, we are very experienced with the city officials. All in all, I know that you are going to get a lot of good out of your discussions and I know that you regulatory men will receive a lot of benefit from the discussions given by the scientific men, and the scientists will get considerable benefits from the problems of the regulatory men. I am glad that the federal Government has representation here, because this is a 3-way program that we all need to put our shoulders to the wheel and work together in a cooperative way. In so doing, I know we are going to have splendid success. Much depends on the work that you are going to do in the field, so I just want to say again that it is a pleasure for me to be here for just a few moments and welcome you here. I know that you are going to have a lot of benefit from meeting together this afternoon, and tomorrow and Wednesday. I know that this is going to be a very important conference and I know that everyone of you are going to get all the benefits that you can out of it.

I thank you very much.

PRESIDENT YOST: I am sure that it is the opinion of everyone here that everyone is appreciative of having Mr. Trovatten here to give us this splendid address of welcome.

There is one item of business that we would like to have the reaction of the conference on at this time, and that has to do with the printing and issuing of the proceedings of the conference. At the Omaha Meeting, it was decided that the host state at each of the annual meetings would be responsible for getting out and distributing the published proceedings. I think the Minnesota people would like to have official action taken on that matter. I wonder if someone would make a motion to that effect. What is your pleasure about printing and distributing the proceedings?

MR. KELTNER: I move that the report be made and distributed by the Minnesota Department, if agreeable to them.

(Motion seconded and carried.)

We will now have the report of the Secretary-Treasurer, Dr. Larson of the University of Minnesota.

SECRETARY-TREASURER'S REPORT, DR. LARSON, MINNESOTA

Three meetings were held during the summer in relation to what the program was to be this year. I do not believe that it would be necessary for me to read any of that because they are already incorporated in the program. I must call attention to the extemporaneous reporters that if you use any high-falutin language, you had better get in touch with the stenotypist before you leave the place. Also, if you do not turn in papers at the present time, see that they are returned here at least by the

first of January so that we can get out the report in time so that it will really mean something.

There are a number here, who were not here last year. Mr. Hanson has brought along some of the overflow supply that they had last year, and if any of you wish to get them, he will have them for distribution.

As for the proceedings for this year, that has been settled, and we thank you for your confidence.

The next thing, perhaps, that would be in line, is the financial report. We are rather modest, as yet, and we hope that we will grow out of our swaddling clothes. This year, our finances are not among the astronomical figures, but our dues are only $15 a year from each one of the States, with no individual dues. The States are represented in each case. Out of the thirteen States that we have in the organization, eleven have come through with their dues, and if you think that this is the first year, and in many cases, there is no really good means of running a swindle sheet in such a way that you could contribute to this, without going to the powers higher up. The following States have contributed: Nebraska, Minnesota, Kansas, Illinois, South Dakota, Michigan, Wisconsin, Iowa, Ohio, North Dakota, and Oklahoma, which gives us a total of $165 to start with. I hope that all the bills in the future will be like those in the past--"0".

When we saw what a good job the people from Nebraska did last year in reporting the proceedings of that meeting, and that it was assumed that the host to the meeting would be responsible for the report of the proceedings, we wondered what we were going to do. We happened to have a man that has a very gentle touch--something like King Midas--and so by his interviewing several people of the State, who are interested, they have come through nicely. The following have made it possible for us to put on this meeting and to provide means for the publication of these proceedings when we are through with it: Twin City Seed Co., Thompson Chemical Co., Minnesota Farm Bureau Service Co., Chippman Chemical Co., E. S. Gandrud of Owatonna, Northrup King & Co., Cargill Elevator Co., Jack Hyland, Pacific Borax Co., Minnesota Seed Dealer's Association, C. B. Lyon, Oldebury Chemical Co., Land O'Lakes Creameries, General Mills, and F. H. Peavey and International Elevator Co. They have seen fit to entrust over $925 to our keeping. We don't know if there is going to be any of it left over or not, but we are wondering if it would be aggreable to them if we would throw this into the jackpot and help get the organization a better financial footing for the years to come. They will have a little time to think it over, but we are putting it up to you at the present time. I know it would be appreciated and have a lot of use.

At this time, our President has a little speech that he has prepared. He said he didn't want to give it, but I know he would be disappointed if he didn't, so I will turn the microphone over to Ted Yost.....

ADDRESS BY PRESIDENT YOST

First of all, I wonder if we could have a motion to accept the Secretary-Treasurer's report. (Motion so made by Mr. C. Schrader and seconded by Mr. Wagner of Kansas--Motion carried.)

We are gathered here to consider one of the nation's leading problems affecting agriculture. Not only are weeds important to the farmer who tills the soil, but the weed problem is likewise important to all commercial trades and activities that deal with any phase of Agriculture. Specifically, we might mention a few such as, the seed trade, the livestock and poultry feed trade, the flour and milling trade, the farm machinery and equipment trade, the chemical producing and chemical sales trade, the dairy products industry, the meat industry, the public highway system, the railroad system, and many others that might be mentioned.

The weed problem is broad in scope, devastating in effect and complicated when considered from the standpoint of cure. I think probably none of us here and probably no one anywhere would be so foolish as to ever think that there would even be a remote possibility that weeds could ever be wholly and completely eliminated by man from the face of the earth. Even if it were possible to do so, it might bring about a serious unbalance of the species. To acknowledge that it is impossible to eliminate the weed problem does not, however, in any way minimize the importance of that problem, nor does it mean that weeds should be allowed to have their own way or that no attempt should be made to hold them in check, or to control their spread.

It was only a few years back when I heard a college of agriculture professor report that their state had no organized program against weeds. He further stated that their college of agriculture took the position that weeds were entirely the farmer's problem and that it was all "just a matter of good farming." Such a "laissez-faire" attitude certainly is short-sighted, and gives no recognition to one of the farmer's most serious handicaps, and a problem which seriously threatens to jeopardize the agricultural resources of our nation, second only to soil erosion.

The seriousness of the national weed problem is increasing by leaps and bounds. Only a comparatively few states seem to be seriously concerned about their weed situation. The few states that are doing a fair to good job of handling their weed problems are doing so with only limited backing, but are achieving worth-while results. We want to congratulate these states for their earnest and forthright efforts. To the other states, we want to urge that the problem be undertaken in a really serious manner before it is too late. Authorities in one state have said that their bindweed situation is so serious that "it is no use." As one wise old farmer said, "Our weed situation is getting no better fast." Had we taken this attitude in our state eight years ago, the situation would be about as follows:

Our State (Kansas) started with approximately 200,000 acres of bindweed in 1938. (These figures were based on actual survey made by deputy tax assessors.) We claim that we have, at this time, held the spread in check and that we also have eradicated and have under control, about 100,000 acres or one-half of the 1938 figure. This achievement has been accomplished in eight short years. On the contrary, had it not been for our efforts to check the spread and to reduce the original acreage, we claim that Kansas now would have at least 500,000 acres or five times the acreage we claim to have at this time. Our annual crop loss from bindweed now is about one and one-fourth million dollars, whereas it would now be over six million dollars annually had it not been for the fight against this dreaded weed. This figure is three times as great as the total cost of conducting the program over an 8-year period. We ask you whether or not it has paid. I hope you will pardon this reference to the Kansas program.

At this point, it would be fitting to congratulate the U. S. Department of Agriculture for the splendid and high quality weed research work which has been done through the Bureau of Plant Industry during the past ten years, under the guidance of Mr. L. W. Kephart, and with the able assistance of F. L. Timmons. L. M. Stahler, C. T. Seeley, and others who have assisted at various times. Had it not been for the findings in their research activities, several of the states, including Kansas, would have been seriously handicapped in conducting a state-wide program against weeds. In like manner, several of the State College Experiment Stations have done much excellent work over the past twenty-five years to help solve some of the complicated problems of the ever-expanding weed menace.

It is, however, our candid belief, that we need more and more research. Both State and Federal Agencies should do two things. First, greatly expand their research activities with weeds, and second, better coordinate all weed research work, and if possible, do the work on the basis of a uniform plan. Every state has its special weed problems. Why not have a federal weed research worker at each state experiment station, just as is being done on other major problems, such as corn, wheat, alfalfa, insects, plant diseases, animal diseases, etc.

We will all agree that our organization has an excellent research committee, which has done a very excellent piece of work during the past year. This committee has been ably guided by Mr. F. L. Timmons of the Bureau of Plant Industry. Research is the fundamental basis for education. Progress in weed work will be guided by well-planned research.

In addition to an expansion in research activities, we need a federal act that will regulate the movement of weed-infested materials across state lines. If this is not done, individual states who are seriously attempting to control their weed problem will be greatly handicapped in protecting themselves against the weed menace of other states. In our state, we have about 1,200 miles of state boundry of which only about 100 miles is a river. Crossing our state boundry, we have 60 railroads, 50 federal-state highways, 75 improved county roads and many times more of the minor roads such as those that are maintained by either the county or township. With such a situation, it is almost wholly impractical, if not impossible to set up a plan that would effectively protect us against infested material crossing our state line. Our Conference has a splendid committee headed by Cliff Schrader of Minnesota, which has made a study of this serious problem and will make some recommendations as to a practical solution.

In the field of education through extension, there needs to be much expansion and development in many of the states. In Iowa, Mr. E. P. Sylwester devotes his entire time to weed problems and activities. In Indiana, Mr. Oliver Lee devotes one-half of his time to weed research and one-half to extension weed activities. In South Dakota, North Dakota, Nebraska and Wisconsin, extension crop specialists have taken an active interest in the weed problem. It would seem that the Iowa plan of having an extension weed specialist who would devote full time to weed work would be desirable in every state. In like manner, the U. S. Department should be interested in promoting good weed work in the various states. Just how this can be done best is a problem for one of our committees, which is headed by Mr. Sylwester.

Uniformity of state seed laws should help materially in better administering the seed laws of the various states, and also assist in the administration of the federal Seed Act. It would be of material assistance to the seed merchandising trade operating across state lines. Even though some noxious weeds may not be bad in some states, they might become a problem in future years, if allowed to get a start. Even though there is very little Leafy Spurge and Canada Thistle and no Sow Thistle in our state, we still believe it would be wise to include them in both our State Pure Seed Law and also in our State Noxious Weed Law. I am pleased to announce that Mr. R. C. Kinch of Nebraska has agreed to accept the chairmanship of the Committee on Uniform State Weed and Seed Laws. We are fortunate to have secured Mr. W. A. Davidson, United States Department of Agriculture, in charge of the Federal Seed Act, to appear on our program.

Our Conference has a committee on the Movement and Sale of Weed Infested Material by Federal Agencies. This committee was headed by Howard Leonard of Illinois, who passed away a short time ago. Due to the extended ill health and the untimely death of Mr. Leonard, nothing has been done by this committee. To the best of our knowledge, there was no extensive activity in the sale or movement of grains for feed or other materials by any federal agency during the past year. The matter of moving or selling feed grains or other weed infested materials by federal agencies should be watched closely by the various states. During the period of July 1, 1942 to February 16, 1945, covering a short period of thirty-one and one-half months, the state AAA program in Kansas sold 6,868,925 bushels, or 5,724 car loads of feed wheat in Kansas, with absolutely no reference to the presence of noxious weed seeds. This program did untold damage in the spreading of noxious weed seeds to clean fields and clean farms. At this time, we believe that our committee on this problem may be discontinued until further need arises.

There have been two other committees, one on Post War Plans, and one on War Equipment. Since the war has come to a successful conclusion, we believe there is no further need for a committee on Post-War plans. Mr. W. L. Klatt of Nebraska has made a study of available war equipment, which might be used in weed programs. It is his opinion that the war used very little, if any equipment that could be used in local weed programs. It is our opinion that these two committees could be discontinued and the membership be assigned to other more important committees where their assistance can well be used.

In closing, may I say that the value of this organization, like others, lies in its ability to achieve at least some of the purposes for which it was set up. Our principal hope of achievement lies in committee action. To serve on a committee is real work if something worth while is going to be achieved. Every member in the Conference should have an assignment so he can assist in building a stronger, more effective and worth while organization to the end that the Federal Department of Agriculture will have a strong weed office set up to cooperate with the various states in research, education and control, and that each state will have a sound and effective law and program to cope with their weed problems.

We hope that each of you will find this meeting both interesting and worth while and that your time here will make you better fitted to carry on your life work.

****

PRESIDENT YOST: At this time, we will pass on to the introduction of delegates by States. I would like to say that we are very glad to have the gentlemen here from Canada. They have a real weed problem. I went out and saw some of their Leafy Spurge and they have conducted some very fine weed programs there. I want to compliment them. They are attacking the problem in a very intelligent manner. I hope you will get acquainted with your friends from Canada during this Conference.

We also want to introduce the Seed Company men and the Chemical Company men and other commercial men. We have a very fine group of visitors, I think, and they deserve a good hand. (Applause)

We are glad to have all of the gentlemen at this Conference. We hope that you will feel at home and get acquainted, as much as you can.

We want to have everyone register. I think everyone is wearing a badge. There are still some that are not. I am sorry to confess that I haven't got my badge yet, but I am going to have it, and I hope each one of you will get your badge so that we will have a complete list of everyone attending the Conference.

I also want to ask that the State Representatives please contact the other delegates from your State and decide who your state representative will be for the ensuing year so that you will be prepared to announce who your State Representative will be at the last session. Please see that this is done, and during the business session each one will introduce your representative for the coming year.

REGISTRANTS

NAME	ADDRESS	REPRESENTING
Aamodt, T. L.	St. Paul, Minn.	Minn. Dept. of Agriculture, Univ. Farm
Abeln, B. A.	Minneapolis, Minn. 4647 Wentworth Ave.	Minn. Dept. of Agriculture, Weed & Seed Div. U. Farm
Armour, M. L.	St. Paul, Minn.	Extension Service Univ. Farm
Arnold, Lloyd E.	New Haven, Conn.	Associated Seed Growers
Ayres, Lee	Winona, Minn.	McConnon & Co.
Bakke, A. L.	Ames, Iowa	Iowa Agr. Exper. Station
Ball, Walter S.	Sacramento, Calif.	State Dept. of Agriculture
Barrons, Keith	East Lansing, Mich.	Dow Chemical Co.
Baxter, Robert	St. Paul, Minn.	N. C. Broadcasting Sys.
Beatty, L. R.	Duluth, Minn. 503 Court House	Land Commissioner St. Louis County
Benham, John F.	Chicago, Ill. 30 N. LaSalle	Am. Seed Trade Assoc.
Berggren, Fred H.	Niagara Falls, N.Y. Buffalo Avenue	Oldbury-Electro Chem. Co.
Berns, Max	Minneapolis, Minn.	Twin City Seed Co.
Berset, M. E.	Minneapolis, Minn.	Northrup-King Seed Co.
Bill, R. H.	Des Moines, Iowa	Successful Farming
Bjerken, Sig.	St. Paul, Minn. 1907 Randolph Ave.	Minn. Dept. of Agriculture, Weed & Seed Div., U. Farm
Bohanon, L. H.	Minneapolis, Minn.	Twin City Seed Co.
Bower, Clyde A.	Oklahoma City, Okla.	State Dept. of Agric.
Brandes, Gordon A.	Grand Forks, N. D.	Agric. Supply Co.
Breeding, Geo. W.	Canton, S. Dak.	
Briggs, Geo. M.	Madison, Wisc.	University of Wisconsin
Bronson, Arthur H.	New York City	Naugatuck Chemical Div.of U.S. Rubber Co.
Bruns, V. F.	Canton, Kansas	Kansas State College
Buckholtz, K. P.	Madison, Wis.	University of Wis.
Burnham, C. A.	Minneapolis, Minn.	Northrup King & Co.
Buskirk, G. C.	Wakefield, Neb.	Wayne County Nox, Weed Dist.
Caldwell, Ralph M.	West LaFayette, Ind.	Purdue University
Campbell, L. E.	Minneapolis, Minn.	General Mills, Inc.
Cardon, Winona	Minneapolis, Minn.	Federal Laboratory
Carlson, Arne E.	Wilmington, Del. Grasselli Dept. Agric.	E. I. DuPont de Nemours & Co., Chemicals
Carter, A. S.	LaFayette, Ind.	Ass't. State Seed Commis.
Catherwood, J. J.	Waterloo, Neb.	J. C. Robinson Seed Co.
Clark, Elmer R.	Minneapolis, Minn. 116 Federal Office Blg.	Federal Seed Laboratory
Clark, Ward	Canistota, S. Dak.	The Clark Corporation
Corbett, L. W.	Minneapolis, Minn.	Northrup-King & Co.
Cornish, C. E.	Ortonville, Minn.	
Crandall, Bernard	St. Paul, Minn.	Minn. Farm Bureau Ser.
Crim, Ralph F.	St. Paul, Minn.	Ext. Agronomist, U. Farm

NAME	ADDRESS	REPRESENTING
Dahl, Math.	Bismarck, N. Dak.	Commissioner of Agric.
Davidson, A. G.	St. Paul, Minn.	R. L. Gould & Co.
Davidson, W. A.	Washington, D. C	U. S. Dept. of Agric.
Day, Dorothy	St. Paul, Minn.	University of Minnesota
Dougherty, Isaac	North Collins, N. Y.	Assoc. Chemists, Inc.
Dunham, R. S.	St. Paul, Minn.	University of Minnesota
Elbers, Herman W.	Steward, Nebraska	Neb. State Weed Committee
Edgerton, Leslie	Minneapolis (1) 334 First St. N.	Security Warehouse Co.
Erickson, E. L.	Brookings, S. Dak.	S. D. State College
Euting, Neil A.	Milwaukee, Wis.	Pittsburgh Plate Glass Corona Chemical Div.
Evans, Marshall	LeSueur, Minnesota	Minn. Valley Canning Co.
Farrell, Thomas A.	Ambler, Pa.	American Chemical Paint Co.
Fisher, H. C.	Minneapolis, Minn.	Northrup King & Co.
Folsom, Stanley	Minneapolis, Minn.	Twin City Seed Co.
Forsyth, D. D.	Madison, Wis.	State Dept. of Agric.
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Fulton, H. C.	Jamestown, N. D.	Standard Agric. Chem.
Fyffe, N. H.	New York City, N.Y.	Oldbury, Electro Chem.
Gandrud, E. S.	Owatonna, Minn.	E. S Gandrud Co.
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Haffner, O. W.	Madison, Wis.	Wis. Co-Op Farm Supply
Hall, William F.	Bound Brook, N. J.	Chipman Chem. Co.
Hammerbeck, George	Little Falls, Minn.	Minn. Dept. of Agric. Weed & Seed Div.
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Harris, John S.	St. Louis, Missouri	Monsanto Chemical Co.
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Speece, Maynard	St. Paul, Minn.	KUOM Radio Station, U. of Minn.
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Stapleton, T. O.	Hibbing, Minn.	
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Tatem, S. B.	Chicago, Ill.	Swift & Co., U. S. Yards
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Timmons, F. F.	Hays, Kansas	U. S. Dept. of Agriculture
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Wegener, Wm. H.	Topeka, Kansas	State Board of Agriculture
Whitford, E. L.	Niagara Falls, N. Y.	Oldbury-Electric Chemical Co.
Willard, C. J.	Columbus, Ohio	Ohio Agricultural Exp. Station
Williams, D. A.	Grand Forks, N. D.	Agricultural Supply Co.
Wilson, A. M.	Edmonton, Alberta, Can.	Field Crops Commissioner, Dept. of Agriculture Provision
Withey, J. H.	Minneapolis, Minn.	Northrup King & Co.
Witman, E. D.	Columbus, Ohio	Ohio State University
Wood, H. E.	Winnipeg, Manitoba,Can.	Dept. of Agriculture, Weeds Commission
Worzella, W. W.	Brookings, S. D.	S. D. State College

Name	Address	Representing
Yost, T. F.	Topeka, Kansas	State Board of Agriculture, President of the Conference
Zahnley, J. W.	Manhattan, Kansas	Kansas State College
Zorsch, Z. P.	Hoboken, New Jersey 1301 Jefferson St.	Standard Agriculture Chemicals, Inc.

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PRESIDENT YOST: Now, I want to give some instructions on committee meetings. Anyone may attend any of the Committees, except the research committee, which is a closed meeting, and I am sure that you will all be welcome, including the commercial men.

The Federal Extension Weed Specialists Committee

Mr. E. P. Sylwester, Botany and Plant Pathology Section, Iowa State College, Ames, Iowa (Chairman)
Mr. W. H. Brokaw, Extension Administration, University of Nebraska, Lincoln, Nebraska
Mr. George M. Briggs, Department of Agronomy, University of Wisconsin, Madison, Wisconsin
Mr. O. C. Lee, Department of Botany and Plant Pathology, Purdue University, LaFayette, Indiana
Mr. U. J. Norgaard, Department of Agronomy, South Dakota State College, Brookings, South Dakota
Mr. D. L. Gross, Department of Agronomy, University of Nebraska, Lincoln, Nebraska
Mr. Loys F. Smith, State Department of Agriculture and Inspection, State Capitol, Lincoln, Nebraska.

Uniform State Seed and Weed Laws Committee

Mr. R. C Kinch, State Department of Agriculture and Inspection, State Capitol, Lincoln, Nebraska, (Chairman)
Mr. Charles H. Keltner, State Department of Agriculture, Springfield, Illinois
Mr. Henry Lunz, State Department of Agriculture, Madison, Wisconsin
Mr. J. Ross Fleetwood, Agricultural Extension Service, University of Missouri, Columbia, Missouri
Mr. E. L. Erickson, Department of Agronomy, South Dakota State College, Brookings, South Dakota
Mr. Clyde A. Bower, State Department of Agriculture, Oklahoma City, Oklahoma
Mr. Norris M. Paulson, State Department of Agriculture, State Capitol, Pierre, South Dakota
Mr. Charles A. Stahl, Department of Agriculture, State Capitol, Lansing, Mich.

Committee on Federal Legislation to Control Interstate Movement of Noxious Weed-Infested Seed, Feed and Other Materials

Mr. C. H. Schrader, Department of Agriculture, University Farm, St. Paul, Minnesota, (Chairman)
Mr. R. C. Kinch, Department of Agronomy, Lincoln, Nebraska
Mr. W. W. Worzella, Agronomy Department, State College, Brookings, South Dakota
Mr. Clyde Spry, State Department of Agronomy, Des Moines, Iowa
Mr. Oliver C. Lee, Extension Service, Purdue University, LaFayette, Indiana
Mr. L. M. Stahler, Bureau of Plan Industry, Lamberton, Minn.
Mr. J. L. Hutchinson, Assistant State Weed Inspector, Paradise, Kansas

Policy Committee

Dr. C. J. Willard, Department of Agronomy, Ohio State University, Columbus, Ohio, (Chairman)
Mr. F. L. Timmons, Hays Experiment Stations, Hays, Kansas
Dr. L. M. Stahler, U.S. Department of Agriculture, Lamberton, Minnesota
Dr. A. L. Bakke, Botany and Plant Pathology Section, Iowa State College, Ames, Iowa
Dr. K. P. Buckholtz, Department of Agronomy, University of Wisconsin, Madison, Wisconsin
Dr. John C. Frazier, Kansas State College, Manhattan, Kansas, (Not present).

Policy Committee - Continued

Mr. Noel S. Hanson, University of Nebraska, Department of Agronomy, Lincoln, Nebraska
Mr. V. F. Bruns, Kansas State College, Canton, Kansas

Additional Members of the Research Committee

Mr. J. W. Zahnley, Department of Agronomy, Kansas State College, Manhattan, Kansas
Dr. E. A. Helgeson, Department of Botany and Plant Pathology, N. D. State College, Fargo, North Dakota
Dr. L. V. Sherwood, University of Illinois, Urbana, Illinois
Dr. O. C. Lee, Department of Botany and Plant Pathology, Purdue University, LaFayette, Indiana

Anyone having any Resolutions may see Mr. Bernard Swenson, Chairman of the resolutions committee. They will be drawing up the resolutions to be presented to this conference.

Resolutions Committee

Mr. Bernard C. Swenson, Department of Agriculture, State of Minnesota
Mr. W. L. Klatt, State Department of Agriculture, State Capitol, Lincoln, Nebraska
Dr. T. H. Gooding, University of Nebraska, College of Agriculture, Lincoln, Nebraska
Dr. C. J. Willard, Department of Agronomy, Ohio State University, Columbus, Ohio
Mr. Clyde Spry, State Department of Agriculture, State Capitol, Des Moines, Iowa
Mr. E. D. Holden, Department of Agronomy, University of Wisconsin, Madison, Wisconsin.

At this time, I would like to ask how the conference desires to elect its officers for next year.

DR. STAHLER, MINNESOTA: Moved that the Chair appoint a nominating committee to present a group of officers for next year.

Seconded by Mr. Viehmayer of Nebraska and carried.

PRESIDENT YOST: The nominating committee will be:

Dr. L. M. Stahler, Lamberton, Minnesota, (Chairman)
Mr. E. P. Sylwester, Iowa State College, Ames, Iowa
Mr. George M. Briggs, University of Wisconsin, Madison, Wisconsin

PRESIDENT YOST: Before we adjourn to the committee meetings, we have one thing we want to do, and then we will adjourn.

Mr. Robert Baxter, who is with the North Central Broadcasting System, is going to take a few minutes to explain to you, at this time, a system of some kind that they are inaugurating on broadcasting. Is he here?

REMARKS BY MR. ROBERT BAXTER, NORTH CENTRAL BROADCASTING SYSTEM

Thank you, Mr. Yost, the expression "servants of the public" has been used a great many times, and very often misused. But certainly, when it applies to an organization doing work, such as you are doing, it is used appropriately.

We, too, feel that we are "servants of the public." We receive our compensation for it, which doesn't make us feel quite like servants, but we are answerable to the people we are trying to serve, just as you are.

Your job is one of curing the farmer's production ails, and he has plenty of them--such as weeds. The work that you gentlemen are doing is helping a great deal in eliminating these curtailments of the farmer's production.

Our job is to help organizations, such as yours, get your word to the people for whom it is meant. The experiments that you have done, and the new discoveries that you have made in bringing about better farming methods, have been a great help to the farmer, but that is only one-half of the job. We must get this information in easily

understandable form to the farm people, in order that they can utilize it. That is where we believe we fit in. The Department of Agriculture, and their Extension Services have their publicity bureaus, but they rely on news papers and radio facilities.

About two years ago, a group of forward-seeing gentlemen in St. Paul got the idea that these small radio stations in the outlying sections of the country, in rural areas, could better serve the farm population if they banded together and formed a Farm Service Network. We have that network formed, and it is due to inaugurate their services the first of the year. It is the Mississippi Valley Network, by the name of the North Central broadcasting system, with headquarters in St. Paul. The main feature of this Mississippi Valley network is its Townand Country Time at six to seven o'clock in the morning, covering twelve states, which is the same group of states which you are including in your conference.

The thought behind getting this group of stations together was that, as a group, they would have better facilities to get farm information to you people, having stations located near by where the information could be localized, covering financial and technical information.

We believe that we have a well-rounded program for our Town and Country Time when it gets started. There is entertainment, with a 15-piece band, a good Master of Ceremonies, markets of all types, and localized markets and road information. We will have special feature programs, too, and educational features, although six to seven in the morning is no time to get down to Einstein theories. We do want to get valuable information down to the farmer and, therefore, we are working up special interest features, in order to create listener appeal.

With the cooperation of you gentlemen, since we are going to do very much the same job--serving the farmer as best we can--the cooperation you will give us, and the other similar working organizations will help us to make this the program what we want to make it, and to live up to the standards set up for radio and newspapers serving the public.

I know that you gentlemen will give us that cooperation, and incidently, we are planning on cutting a few records with some of the men of your converence that can be used later on our program. When we get a series of these recordings made, we will run off some that you can listen to. Thank you, gentlemen.

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PRESIDENT YOST: The chairmen of the committees may adjourn first in order to find their respective rooms.

MONDAY P. M. SESSION ADJOURNED 3:20 P. M.

TUESDAY MORNING SESSION

The Tuesday Morning Session of the North Central Weed Control Conference was held in the Spanish room of Hotel Lowry, Tuesday, November 27, 1945. The meeting was called to order at 8:50 A. M. by Mr. F. L. Timmons, Chairman.

MR. TIMMONS: Gentlemen, we are a little late in getting started, so we are going to have to find thirty minutes somewhere this morning as we want to be finished before some of you fellows start to wear out and have to call for reinforcements.

The uniform program of experiments with 2-4-D and other new chemicals is a project of the Research Committee of this Conference. This program could not have been carried out, had it not been for the existence of this Conference, or some similar organization. Therefore, anything that may have been accomplished by this uniform program this year, can be legitimately designated as one of the first fruits of this organization.

Any discussion of the development of our uniform plan, should begin with our first annual meeting of this Conference at Omaha in November of last year.

Some straws were in the wind and some prophesies were being uttered at that meeting, which gave strong indications of developments, which have since taken place.

Our prophet, in this case, was L. W. Kephart of the U. S. Department of Agriculture, who closed his discussion of chemial weed killers after the war with the

following statements, and I want to read from the proceedings of last year:

"Weed control with chemicals is coming into a new era, with new processes and new situations which most of us are really not prepared to encounter. Suddenly, we are being offered new concepts of chemical weed control, with ideas backed, for the first time, by the tremendous resources of the chemical industry. What are we going to do about it? Obviously, something must be done or the country will be subjected to the unhappy spectacle of claims and counter claims made by voluble proponents, each insisting that his own product is best. In such a chemical cacophony, the poor hardworking weed man and his farmer friends may well lose their bearings and become hopelessly confused.

"Someone must act as umpire in this situation. We, who are on the firing line, will naturally be the ones to feel the greatest pressure. Are we not the ones who must find the answer? Collectively, we must work together to the end that facilities and personnel are available to do this job. The responsibility is squarely upon us. Let us not turn away."

In the discussion that followed this, Mr. Kephart gave some of the results on 2-4-D in 1944. He made the following remarks:

"There thus appears to have been introduced into the weed picture, a new chemical weed killer of tremendous potentialities. Already some rather sensational stories about it have appeared in the press, and several periodicals, including the COUNTRY GENTLEMAN, are preparing feature articles about it. In this situation, it behooves all weed people to inform themselves about the process. Next year, no doubt, tests by the hundreds will be undertaken all over the United States, and some disinterested agency will be needed to assemble the results of these tests and correlate them. If I may be permitted to say so, the logical group to do this for this area, is the research committee of this Conference."

So, they submitted to this Committee a Report which they sat up until midnight to complete, for closer cooperation among research workers, which reads as follows:

"The co-ordination of the various experiment stations and the Bureau of Plant Industry plans of experiment or methods of attack on certain weed problems of regional importance to permit comparison of the results in the different parts of the region and a quicker solution of the problem than would be possible through independent research of the various stations under different plans."

That report, in its entirety was adopted by the conference. However, this mandate to the conference was not immediately applied to the 2-4-D situation. The spark which really started off the program was given by Noel Hansen, our conference vice president, and also a member of the research committee, in a letter of January 22, 1945 to me, suggesting for the first time, that we set up a uniform program of experiments with 2-4-D.

After much correspondence, five members of our 9-man research committee found it possible to get together for a couple of days at Manhattan, Kansas on February 15 and 16, 1945 to draw up the tentative first draft of the uniform plan, using the meagre supply of information that was available on 2-4-D and other hormone-like chemicals. The first draft of the uniform plan was sent to the members of the research committee on February 27, 1945 requesting their suggestions for revisions and additions. Some excellent ideas were promptly forthcoming, and by March 16, the second draft of much improvement, was sent out to the Committee members for their revisions, and again the response was prompt. On March 31, 1945 the final draft of the suggested uniform plan of experiments with herbicides, particularly hormone-like organic-like chemicals in the North Central States was mailed to the thirteen state experiment stations.

This, I believe, set some sort of a record for getting committee work done almost entirely by correspondence, where so many men, so widely separated, were involved. I would like at this time, to publicly congratulate the members of the Research Committee for the keenness and thoroughness with which they studied the proposed plan, and their promptness in returning them to the Chairman.

The final draft of the uniform plan turned out to be a 20-page mimeographed booklet, including seven distinct features. First, a statement of the objectives of the plan; second, a list of the chemicals to be tested, and their sources; third, a uniform code system of designating the experiments and the various treatments; fourth, the outlines of six suggestive experiments on various weed problems, giving

the chemical formulation, concentrations, rates of application, and stages of growth of crop and weed plants; fifth, suggestions for conducting the experiments, as to plot plan and replication, determination of results and retreatments; sixth, a set of seven tables, showing the amounts of the various chemicals necessary to prepare a different concentration of spray solution in amounts up to 10-gallons and, seven; a complete list of references to technical and popular articles on hormone chemicals published up to that date.

Thus, the uniform plan contained, or referred to about all of the information that was available at the time, on the hormone-like chemicals as herbicides, and it had developed out of the composite of the thinking of nine men who are among the most active weed research workers in the country. Our committee was somewhat concerned with the thought that the bulk and comprehensiveness of the suggested plan might discourage the station directors and our would-be cooperators. We sought to overcome any such discouragement with the following statements in the objectives of our program:

"A rather comprehensive set of experiments is planned in order to cover most of the important weed problems of the region, and to permit all states to participate in at least part of the uniform program. It is realized that probably no single experiment station will want to carry out all of the experiments. However, it is hoped that the experiment, or experiments that are conducted will follow the uniform plan so that the results will be directly comparable with those in other states conducting the same type of experiment on the same weed or weeds. The committee has no desire to limit the experiments carried on in the region to those outlined in the uniform plan, nor to exclude any chemicals, rates or dates from the experiments that any station may want to include for local information."

The uniform plan experiment provided for testing eight different chemical formulations containing 2,4-D or a salt of 2,4-D. Provision was made for including any new chemical formulations that might be made available later in the year. At least 12 additional products were made available later, and several were included in many of the uniform experiments. Others became available too late in the season to be included in experiments from which results are available this year.

More than 80 copies of the uniform plan were sent to prospective cooperators and others interested. Many requests were received from persons outside our North Central States Conference, in states as far east as New Jersey, as far west as Washington and California, and as far south as Arizona and Texas. I have here, a map of North America, showing the boundaries of our Conference outlined in red. The points to which uniform plans were sent, but from which no results were reported are indicated by green thumb tacks, and the stations or points from which results were reported for summarization in our regional summaries are indicated by blue thumb tacks.

There was a total of 30 cooperators reporting results from a total of 140 different experiments on different weeds. The honor of conducting the largest number of experiments on the various weeds goes to Dr. L. M. "Chuck" Stahler, in charge of cooperative federal-state weed investigations in Minnesota. He carried on 23 different tests with 12 different weeds. You will note the considerable number of cooperators in the Canadian Provinces. When requests for copies of our uniform plan of experiment began to come in from weed research workers in Canada, we invited them to cooperate with us in the plan and to participate in the regional summarization of results. Their response has been gratifying, indeed. Our regional summaries to be reported upon this morning include results from 36 different experiments in Canada. These results will have largely lost their identity in the summaries so that the reports will probably include very little duplication of what Dr. E. S. Hopkins will say when he reports on 2,4-D experiments in Canada later this morning.

Our research committee was divided into four 2-man sub-committees for the summarization work, and each sub-committee assigned the task of summarizing and reporting upon the results from one or two of the uniform experiments. I have only second-hand information, but I suspect that the task of summarization resulted in many a headache for the members of these committees. Despite the fact that the experiments from which results were reported were based on uniform plans, there were some variations in treatments and other details in nearly all cases, so that the problem of correlating the results and arriving at conclusions as to what they showed was a tedious and difficult problem. I am certain that we all feel our debt of gratitude to these men for pre-digesting this complex mass of data and serving them to us as condensed statements and ideas on the possibilities of the hormone-like chemicals in weed control. We will all be able to get a much more clear-cut composite

picture of the 2,4-D situation up to date.

The first report this morning is by Mr. Zahnley and Mr. Bruns on experiment 1, which tested the effectiveness of 2,4-D on perennial weeds at different times or at various stages of growth. They will also report on experiment VI, which was designed to determine the intensity and duration of effects of 2,4-D in the soil on the growth of weed and crop plants. Our first speaker will be Mr. J. W. Zahnley of the Kansas Experiment Station, who, as most of you know, was pioneer in the discovery and testing of sodium chlorate some twenty years ago, and he is still pioneering. We are glad to hear what he had to say this morning about 2,4-D.

EXPERIMENTS I AND VI, 2,4-D, MR. J. W. ZAHNLEY, MANHATTAN, KANSAS

Thank you, Mr. Timmons. I want to remark about Mr. Timmons accusing us of predigesting these results. I am inclined to believe they are indigestible! But I am in hopes that we have been able to find something about them that will be indicative of some trends and assure us that our time and efforts have not been lost.

I will first give what we think we have learned from Experiment I, the Effect of the State or Time of Application on Perennial Weeds. Here I wish to give credit to my colleague, Mr. V. F.Bruns, who has done practically all of the work of summarizing Experiment I. Quite a number of results were reported in a way that made it difficult to fit them into the summary. The summary does not include all of the work which has been done, but it does include everything that we thought could be safely used without destroying the comparability of the results in different places.

First, let us notice the influence of the state of application of 2,4-D on field bindweed, as shown on the first chart. I am quite sure that this chart cannot all be read, but if you can't see the figures, you can at least see the direction of the lines. These lines represent the percentage of kill, as expressed in terms of the percentage of reduction in the number of plants that come back after treatment. We don't want to call it "kill" - probably we should call it reduction in stand. It is hardly the percentage of "kill" because we don't know whether they are killed or not. The average of all three rates is used. It would make the summary quite complicated if we used each one. The tabular result would show each rate separately. This is the average of the three rates and the points on this chart show the reduction in stand from treatment at the following stages--pre emergence, full-emergence, pre-bud, full-bloom, and summer dormancy. At the Hays, Kansas Station, it shows that the kill at the pre-emergence stage was rather low and came up much higher when the application was at the full-emergence stage and rose a little at the pre-bud stage, and dropped off at the full-bloom stage.

Results at the Lincoln, Nebraska station follow somewhat the same general trend--lower at the pre-emergence, higher at the full-emergence, higher at the pre-bud, and still higher at the full-bloom.

This dotted red line represents the results in Canton, Kansas, in the East Central part of the State. We have just the three stages there--full-emergence, pre-bud, and full-bloom. The variations there are not very great in the three stages, but favor the pre-bud stage.

The last station, Indiana, was included partly to get the spread in climatic condition, but mainly because there were three stages that could be used in this summary. Here again, application at the pre-bud stage seemed most desirable. At some of the other stations, the stages were spread widely apart and sometimes there were only two stages.

Although the average annual precipitation at the different locations ranged from 22.75 inches at Hays, Kansas to 38 at Lafayette, Indiana, the influence of this factor is not apparent.

It looks from this chart, as if the best stages for applying 2,4-D to bindweed ranges from bud-stage to full-bloom.

In his summary of this experiment, Mr. Bruns makes the following statements: "The majority of the cooperators stated that the results reported were only tentative and that conclusive data on the experiments started in 1945, will hardly be available this year. Any attempt to ascertain the approximate time to apply 2,4-D on bindweed, as shown by the reports, is purely assumptive. We cannot make positive statements. There is no conclusive data on late summer or fall applications. We do not have

sufficient work on the later applications, mainly because those applications had been made too late to give us an opportunity to make a fall reading that would mean anything."

The next weed that I want to report on is hoary cress. For some reason, we did not get as many reports on hoary cress. We have had only three on the time or stage of treatment--one from Hays, one from Brandon, Manitoba, Canada, and one from Dalroy, Alberta. The one from Hays indicated the highest kill for hoary cress was at the pre-bud stage. That at the full-bloom stage considerably lower and the summer-dormancy stage very low, dropping down to almost no kill at all in the latter stage.

The work from Manitoba did not include the same stages, but included what were designated as the bud stage and well-developed growth stage, and the results were almost alike. Results reported from Alberta on treatments made at three stages of growth showed no kill and no noticeable results in any stage, as far as killing the weeds was concerned. So much for hoary cress. I do not think it worthwhile to show a chart on that.

The next perennial is the sow thistle, for which results from only one station are summarized on the next chart. The report gives the results of treatments at the spring-rosette stage, bud-stage, and fall-rosette stage. Apparently there was some result on fall-rosette, but it must be noted that the period from the time of treatment until the effects were judged is short. There is not much difference between the spring-rosette stage and the bud-stage on sow thistle.

The result from the fall-rosette stage applications should be discounted, due to the short period in which the observations were made. The better results are obtained from applications made during the spring-rosette stage than in the bud stage and possibly even better results might have been obtained from the spring-rosette stage if the favorable weather conditions followed. It appeared that weather conditions were not considered too favorable. Climatic conditions favored the bud-stage of application.

Lateral roots were generally uninjured, according to the reports, even where the main root was killed beyond the laterals. Here I might mention that Dr. J. C. Frazier, unable to be here, sent with me some pictures which were taken of treated plants that he excavated. Some of these show quite clearly that the chemical apparently does not follow the laterals to the extent that it does the vertical root.

According to this report from Lamberton, Minnesota, the depth that the main root was killed ranged from zero to eighteen inches. Heavier rates of application produced on the average, a greater percentage of kill. It was reported that treated sow thistle plants always developed cancerous nodular growths on the roots, even those that survived the treatment. A full kill of top growth, when application was made during the fall-rosette stage, was obtained. However, lateral roots were not killed by these treatments, and, of course, that gives reason for anticipating a come-back of growth in the spring. There were no outstanding results from any treatments. In fact, the average was relatively a poor kill.

The stages of treatment of Canada thistle include full-emergence, pre-bud, full-bloom, and summer-regrowth, or aftermath, or regrowth after summer dormancy. The variations in the results of applications at those different stages did not seem to be very great. The lines on the graph are pretty level.

The data on this is taken from the Lamberton, Minnesota station and the Madison, Wisconsin station. Those two seem to have the most usable data for Canada thistle.

As nearly as we could summarize, the summer-regrowth stage should be discounted to some extent. It is questionable whether a true estimate can be obtained the same season in which such treatment is made. The following observations are gleaned from the reports. Flower production ceased when 2,4-D was applied at pre-bud stage. New shoots grew normally and produced flowers and seeds during this season. Flowering stems are not easily killed as they remain partly green for a long period. The depth of kill of the main root ranged from zero to fourteen inches. The lateral roots apparently suffer little injury, even though there were apparently some discrepancies.

The next weed that we have data on here is the leafy spurge. Reports from Lamberton, Minnesota and Melita, Manitoba were summarized. At Lamberton, treatments were made at the pre-bud, full-bloom, late-bloom, and full-regrowth stages. Apparently the full-bloom stage showed the lowest kill, which may indicate that the full-bloom stage is a poor time to apply 2,4-D on leafy spurge. In the test, 50 percent

of the old stems were not killed by application during that stage, although the foliage being wet at the time of the spraying may have had some influence. Also, we note that in both experiments, rain occurred within fourteen hours after applications at full-bloom stage.

Plants reemerging on both stages bloomed and produced seed in August and September. Plants treated at the full-bloom stage did not produce seed. The results were relatively poor in all treatments.

The next weed that we want to give attention to is the Texas blue weed. A report from only one station was received. This was Amarillo, Texas. Treatment at the pre-bud stage gave a high kill but treatments at later stages gave very poor results. No effect was found on the blue weed when the treatments were made in the late summer.

The only report received on Russian knapweed was from Alberta, Canada. Treatments were made at full bloom to early seed, seed well developed, and pre-frost stages. There was no observable effect from any of the treatments. It should be noted that applications were made at rather late stages of growth. No applications were made at full-bloom or pre-bud stage. It is entirely possible that knapweed is highly resistant to 2,4-D, but no conclusion should be made until tests are made on earlier stages of growth.

Uniform Experiment VI
Tolerance of Crop Plants to Residual 2,4-D in the Soil (Mr. Zahnley)

The results of this experiment measured in terms of the average of all tests shows some fairly definite tendencies. There are a few discrepancies in the results at different stations, which cannot positively be accounted for, however, most of these are apparently due to the use of different crops, or to climatic differences.

Table 1, which has just been passed out, shows the influence of different rates of application upon the stand and subsequent growth of crops planted immediately before treatment of the soil, and at intervals of 2, 3, 13, 24, 37, and 52 days after treatment.

In the first vertical column, on the left of this table, the rates of application in gallons per square rod of 2,4-D, 1000 ppm. are given. A study of the first four horizontal rows of figures across the page will show that there is a progressive decrease in stand and in the percentage of normal growth as the rate of application increased from 3/4 gallon per square rod to 10 gallons per square rod. The number of crops used at each station, included in this summary, is shown in the fifth horizontal row of figures, and this is followed by the number of days intervening between application of the chemical and planting. (SEE TABLE 1 on page 23)

An over-all picture of the residual effect of 2,4-D was made by averaging the percent stand and percent normal growth of twenty-three crops planted at different times, relative to the time of application of the chemical at six locations in four states. The results are shown graphically on Chart 1.

An examination of Table 11 (on page 24 .) leads to the conclusion that the effect of 2,4-D on the soil does not persist for a very long period. Four crops in this table were planted at five intervals: immediately before application of the chemical, and at 2 days, 13 days, 24 days, and 37 days after. These crops were oats, beans, onions, and tomatoes, representing a wide range of types of crops. It will be noted that in Wisconsin, there was little damage to these crops after 13 days and none after 37 days; and severest damage occurred on plots planted immediately before treating the soil. At Hays, Kansas, there was severe damage at 24 days after treatment. At Lamberton, Minnesota, a 62 percent stand on these crops was obtained when planted two days after treatment. Weed growth on the plot treated with ten gallons per square rod, indicated that the effect of 2,4-D had disappeared within thirty days.

I think, now, that I have taken more time than I should, and will not go into any further analysis. The explanatory notes and observations on residual effect of 2,4-D on the soil, and Chart 1 and Tables 1 and 11, will complete this report.

EXPLANATORY NOTES AND OBSERVATIONS ON RESIDUAL EFFECT OF 2,4D ON THE SOIL

Wisconsin:
Data on plant stand were taken 37, 39, and 20 days respectively after the three plantings were made. Crops apparently recovering slightly from the effects of

2,4-D after these lengths of time.

Data on time of emergence was given, which showed that 2,4-D had marked retarding effect on the rate of emergence of several of these crops. The most severe damage was from applying 2,4-D after the crop had been planted. The higher rates were more inhibiting in their effect but this was not consistently proportional to amount applied.

Of the crops tested, hemp and carrots appeared to be the most sensitive and oats the most resistant. Tomatoes, which are highly sensitive to 2,4-D applied to their foliage, appeared moderately resistant to residual effect.

Effect of rain: 1.51 in. of rain fell within two weeks after application.

Ohio:

Corn, rape and tomatoes were used, the latter transplanted one month later. Two vigorous young apple trees each had 10 gallons Dow A510 at 2000 ppm. applied to soil under the branches with no injury or visible effect. Other crops planted were too badly washed out by a heavy rain to record normal germination.

Minnesota:

Area was double disced, immediately after treatment with 2,4-D May 16 and a half inch of rain fell that evening. Crops were planted May 18. By June 15 annual weed growth was well established on plots treated with 10 gallons of spray, indicating that all residual effects had been eliminated.

Indiana:

Tomato plants set, and corn and beans planted three days after applying chemical to the soil. Plantings of some crops made 30 days later grow normally.

Note: Treatment of 1 1/2 gallon or more injured plants, but the chemical soon disappeared from the soil. Ten gallons killed all weeds, except quack grass for thirty days after it was applied.

Ottawa, Ontario:

Flax, buckwheat, soybeans, peas, barley, and corn were planted. Flax was most susceptible to injury ranging from a fair stand on the 3/4 gallon application of 2,4-D to none on the 10-gallon treatment. Peas were only slightly more resistant than Flax. Soybeans were somewhat more resistant than peas. Barley was uninjured by any of the treatments.

The effect of these treatments upon corn was the most surprising. The application of all rates of Dow A510 seemed beneficial to corn, with the best growth on the 2 1/4 gallon treatment. Photographs were presented, showing an abnormally rank growth of corn on the treated plots, compared with the untreated check.

A heavy infestation of purslane was observed on all except the plot receiving ten gallons of the 2,4-D solution. Only a few purslane were found in this plot.

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MR. TIMMONS: We are scheduled for five minutes' discussion, but after each of these reports, we seem to be shorter of time. However, while they are taking this photograph perhaps we should open the program up for discussion on the first report. Any questions or contributions on the stages of growth or the residual effects?

MR. BRIGGS, WISCONSIN: On Canada thistle, he referred to the late growth--did he mean 4, 6, 8, or 10 weeks, or just what the height of the stubble was that they treated?

MR. ZAHNLEY: I really couldn't answer that. Sometimes the stage of growth was given without indicating the date at which the treatment was put on.

MR. BUCKHOLTZ, WIS.: It was put on when 6 to 8 inches high.

TABLE I. RESIDUAL EFFECT OF 2,4-D

Influence of Different Rates

Average Percent Stand and Percent Normal Growth of Crops Treated with 2,4-D, 1000 ppm., at Different Rates

Rate Gal./ sq. rd.	Ohio		Indiana		Kansas (Hays)		Wisconsin		Wisconsin		Wisconsin		Minnesota		Ottawa, Ont.		Kansas (Hays)	
	% stand	% normal	% stand	% normal	% stand	% normal	% stand	% normal	% stand	% normal	% stand	% normal	% stand	% normal	% stand	% normal	% stand	% normal *
3/4			100	100	65.4	60	54	37	100	93	100	100	90	94			87	88
1 1/2	100	100	99	54	38	31	41	21	100	91	100	100	88	88			39	79
2 1/4			72	66	26.4	16	27	22	100	87	100	100	79	71			57	79
10	100	100	0	0	11.5	3	17	10	98	69	100	100	26	60			27	52
No. crops	3		3		14		9		9		9		13		6		6	
Planted after treatment; days	not stated		3		24		planted before treatment		13		37		2		a few days		52	

See explanatory notes

* Based on yield of forage in percent of untreated check.

TABLE II. RESIDUAL EFFECT OF 2,4-D

Influence of length of period between time of application of 2,4-D and time of planting the crop upon stand and percent normal growth (2 1/4 gallon rate).

Crop	Immediately before. Wis.		2 days Minnesota		3 days Indiana		13 days Wisconsin		24 days Kansas		30 days Indiana		37 days Wisconsin		52 days Kansas		Few days, Ottawa, Ont.
	% stand	% normal	% stand	% normal	% stand	% normal	% stand	% normal	% stand	% normal	% stand	% normal	% stand	% normal	% stand	% normal	
Barley			80	10					30	20							
Corn			40	100							100	100			65	F - 98 G - 38	
Flax	20	20	100	100	100	100	100	80					100	100			
Kafir															100	F - 76 G - 43	
*Oats	80	60	60	70			100	80	70	40			100	100			
Rye									60	10							
Spring wheat			100	60													
Winter wheat									70	20							
Buffalo grass									40	80							
Bromegrass			100	100													
Canary grass			100	100													
Millet															80	155	
Sudan															95	85	
Alfalfa			90	100					0	0					tr.	10	
Soybean					49	98					100	100					
Sweet clover			100	100					0	0					10	50	
*Beans	40	40	90	25			100	60	40	30			100	100			
Beets	20	20					100	100					100	100			
Cabbage	10	10					100	100					100	100			
Carrots	0	0					100	100	0	0			100	100			
Lettuce									0	0							
*Onions	10	10	100	100			100	100	80	30			100	100			
Peas			50	70					0	0							
Potatoes			100	90													
Spinach									0	0							
*Tomatoes	60	40	0	0	75	0	100	100	0	0	100	100	100	100			
Hemp	0	0					100	60					100	100			
Av. of 4 crops marked *	47	37	62	49			100	85	47	25	100	100					
Av. all crops	27	22	81	73	72	66	100	87	28	16	100	100	100	100	58	79	
No. of crops	9		14		3		9		14		3		9		6		

F - Forage
G - Grain

See explanatory notes.

MR. TIMMONS: Before going to the next report, I want to ask you to please hold these reports down. The details can be gone into later in the discussion.

If there is no further discussion, I will call on Mr. Hanson, who is reporting on Experiment 11, the Testing of Various Concentrations and Rates of 2,4-D on Different Deep-rooted Perennial Weeds. Mr. Hanson

EXPERIMENT 11, 2,4-D, MR. NOEL S. HANSON, LINCOLN, NEB.

Thank you, Mr. Timmons. Mr. Timmons went over the picture as far as the uniform plan was concerned, and he gave a "pat on the back" to the research committee. I certainly think that those of us who are members of that committee owe a vote of thanks to him for the work that he has done in assembling a lot of ideas and putting them down in a workable plan--at least workable to the extent that we have used it this year, and are trying to make our reports on a uniform basis. He has done a big job and has carried a big load. We certainly thank you for the help, Mr. Timmons.

Coming down to the matter of cooperation, it reminds me of the Bantam rooster which got into the yard with 20 big Belgian horses. Every place that he looked, there were great big hoofs all round him, and he realized that one hoof misplaced would be the end of him. He thought that he had better use a bit of tact, so he got back and looked up at the horses, and said, "Now, boys, let's be careful and not step on one another!"

The following is a list of cooperators on Experiment 11:

	Location	Weeds Studied	Cooperators
1.	Urbana, Illinois	Bindweed, poison ivy, Johnson grass and others	Dr. R. F. Fuelleman, Dept. of Agronomy, Univ. of Illinois
2.	LaFayette, Indiana	Canada thistle, bindweed	Mr. Oliver C. Lee, Dept. of Botany, Purdue Univ.
3.	Cherokee, Iowa	Canada thistle, bindweed	Dr. A.L. Bakke, Dept. of Botany, Iowa State College
4.	Canton, Kansas	Bindweed	Mr. Vic Bruns, Dept. of Agronomy, Kans. State College
5.	Hays, Kansas	Bindweed, hoary cress, dog-bane, bur ragweed, swamp smartweed, Johnson grass	Mr. F. L. Timmons, U. S. Dept. Agri. Hays Exp. Station
6.	Manhattan, Kansas	Bindweed, hoary cress	Prof. J. W. Zahnley, Dept. of Agronomy, Kans. State College
7.	Rochester, Minnesota Vasa, Minnesota	Austrian field cress hoary cress	Dr. R. B. Harvey, Univ. of Minnesota (Deceased)
8.	Winnipeg, Manitoba	Bindweed, leaft spurge, Canada thistle, perennial sow thistle, poison ivy	Mr. H. E. Wood, Manitoba Dept. of Agriculture
9.	Redwood Co., Minn. Redwood Co., Minn. St. Louis Co., Minn. Ottertail Co., Minn. Meeker Co., Minn.	Bindweed, milk weed Hedge bindweed Poison ivy Leafy spurge Canada thistle, perennial sow thistle	Dr. L. M. Stahler, U. S. Dept. of Agri., Lamberton, Minn.
10.	Tecumseh, Nebraska Wahoo, Nebraska	Bindweed, hoary cress Canada thistle, Russian knapweed	Mr. N. S. Hanson, Dept. of Agronomy, U. of Nebraska
11.	Columbus, Ohio	Bindweed, poison ivy, hedge bindweed, man- o-the earth, others	Dr. C. J. Willard, Dept of Agronomy, Ohio State Univ.

12. Stillwater, Oklahoma	Bindweed & horse nettle	Mr. W. C. Elder Dept. of Agronomy Oklahoma A & M College
13. Ottawa, Ontario Charlottetown, Ont. Melita, Manitoba Locombe, Alberta Brandon, Manitoba Calgary, Alberta	Bindweed Oxeye daisy Leafy spurge Leafy spurge Hoary cress Russian knapweed	Dr. E. S. Hopkins Dominion Dept. of Agriculture
14. Saskatoon, Sask	Bindweed, Canada thistle, hoary cress, leafy spurge, perennial sow thistle, blue lettuce, poverty weed	Dr. T. Pavlychenko Plank Ecology Laboratory University of Sask.
15. Brookings, S. D.	Bindweed, perennial sow thistle, leavy spurge	Mr. E. L. Erickson Dept. of Agronomy S. D. State College
16. Amarillo, Texas	Bindweed, Texas blueweed	Mr. Charles J. Whitfield Soil Conservation Service U.S.D.A.
17. Perryton, Texas	Bindweed	Mr. Hood Wills County Ext. Agt.
18. Madison, Wisconsin	Canada thistle	Dr. K. P. Buckholtz Dept. of Agronomy U. of Wisconsin

This report will be given in two parts. I will present information on Bindweed, Hoary Cress, Leafy Spurge, and Russian Knapweed. Dr. Bakke will report on Canada Thistle, Perennial Sow Thistle, and Poison Ivy. I will try to push along as fast as I can and rather than devote time to individual stations, I will try to go over an average of the data submitted by the various cooperators, and compare the results of the concentrations and rates of application of 2,4-D for the various perennial, deep-rooted weeds studied.

Bindweed, (Convelvulus arvensis)

In practically every case, the applications were made either in the pre-bud or the fullbloom stage of growth. The conditions seemed for the most part, to be favorable in regard to temperature, humidity, time elapsed before the first rain, and soil moisture, except at Manhattan, Kansas and Amarillo, Texas. Humidity was low at both locations at the time of treatment and soil moisture was low at Amarillo, Texas, for several days after treatment. The results from 2,4-D were poorer from those two stations than from the others. It is an indication that either humidity or soil moisture, or both, may influence the results from 2,4-D.

In making comparisons, I will be referring to percentages of kill. I want to particularly emphasize that this means reduction of the top growth and does not mean that the roots are likewise killed to this extent. This point is important and I would like to have you keep it in mind when judging the results.

As far as concentrations and rates are concerned, I have listed the various products, and I am going to go down through the various concentrations and take one concentration and one rate at a time, and give you the number of experiments in which it was reported and the average result. All of the products applied at one concentration and one rate were included in the average.

The uniform plan was set up to include four concentrations on perennial weeds. These were 500 ppm, 1000 ppm, 1500 ppm, and 2000 ppm. The rates were 3/4, 1 1/2, and 2 1/4 gallons per square rod, or 120, 240, and 360 gallons per acre, respectively.

500 ppm	3/4	gal.	per	sq.	rod	4	experiments	91.0%	Reduc.	Top	Growth
"	1 1/2	"	"	"	"	7	"	85.0"	"	"	"
"	2 1/4	"	"	"	"	5	"	91.7"	"	"	"
1000 ppm	3/4	"	"	"	"	29	"	91.3"	"	"	"
"	1 1/2	"	"	"	"	52	"	83.1"	"	"	"
"	2 1/4	"	"	"	"	27	"	81.8"	"	"	"

1500 ppm	3/4	gal.	per	sq.	rod	5	experiments	94.7%	Reduc.	Top	Growth	
"	1 1/2	"	"	"	"	7	"	95.2"	"	"	"	
"	2 1/4	"	"	"	"	5	"	93.8"	"	"	"	
2000 ppm	1 1/2	"	"	"	"	15	"	86.0"	"	"	"	

(Average data for all of the 2, 4-D products are included in table 1, page 23).

From this summary you will note that there is little, if any, appreciable difference between the rates or concentrations and in general the lower are about as effective as the higher. In practically all of the experiments where 2000 ppm was applied there was a decrease, as compared with 1500 ppm. Whether it is possible that heavy concentrations kill the top growth, too rapidly and that there is reduced penetration of 2,4-D to the roots, I do not know. That is one thing that we need to find out. Where sodium chlorate was applied at the rate of four pounds per square rod, the average percentage of surface kill at five stations was 68.2. I want to point out, however, that these were spring and summer experiments with sodium chlorate, and at almost all of these stations, spring and summer treatments have not been very effective.

I mentioned that with 1000 ppm of 2,4-D at 3/4 gallon to the square rod, in 29 experiments, there was an average of 91.3 percent reduction of top growth. A comparison of individual products at 1000 ppm and 3/4 gallon per square rod is as follows:

Dow A-506	90.1	percent
Dow A-510	93.2	"
Carbowax	91.4	"
DuPont IN 6065	88.6	"
DuPont IN 4311 A9	95.2	"
DuPont IN 6065 A7	94.7	" Not Incl. in Aver.
DuPont IN 6065 A9	74.4	" " " " "
Weedone	95.4	"
Weedicide tablets	94.8	"
Weedicide liquid	88.3	"
Chipman 2,4-D Weed Killer	84.6	"
Average	91.3	"

I have rapidly run through this series to show you that when these products are applied on an equal basis, as far as the active ingredient, 2,4-D is concerned, there is not a great deal of difference between them. I do not believe that with present methods of evaluating survival that these small differences can be considered as significant, except perhaps with DuPont in 6065 A9 which is considerably lower than the rest.

The time is going rapidly, and I will try to stay on time. I think it is worthwhile to go through a few general comments.

1. With the exception of two or three locations, the percentage of surface kill ran high, but in very few cases were 100 percent kills reported. Again I want to emphasize that the percentage of kill refers to the top growth, and not to the roots.

2. The consensus of opinion was that the percentage of top growth kill indicated by surviving plants was not indicative of the total result and that both vertical and lateral roots were found to be alive.

3. In general, there was little increase in effectiveness, due to increase in concentration and rate. Where the lower rates can be applied uniformly to the vegetation, they will perhaps be sufficient.

4. Where the concentration was increased to 2000 ppm there appeared to be a decrease in percentage kill, as evidenced by shoot survival.

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TABLE 1 BINDWEED

EXP. 11. CONCENTRATIONS AND RATES OF 2,4-D ON PERENNIAL WEEDS, 1945

Concentration in Parts Per Million	Rate in Gallons Sq. Rod	2,4-D Product	No. of Experiments	Average percent reduction in top growth
500	3/4	Dow A-506	2	89.6
"	"	Dow A-510	2	92.3
Average			4*	91.0
500	1 1/2	Dow A-506	4	92.7
"	"	Dow A-510	2	97.3
"	"	Deeweed No. 1	1	65.0
Average			7*	35.0
500	2 1/4	Dow A-506	3	91.4
"	"	Dow A-510	2	92.0
Average			5*	91.7
1000	3/4	Dow A 506	5	90.1
"		Dow A 510	5	93.2
"		Carbowax	5	91.4
"		DuPont IN 6065	2	88.6
"		DuPont IN 4311 A9	3	95.2
"		DuPont IN 6065 A7	2**	94.7**
"		DuPont IN 6065 A9	2**	74.4**
"		Weedone	3	95.4
"		Weedicide tablets	2	94.8
"		Weedicide liquid	2	88.3
"		Chipman 2,4-DWeed Killer	2	84.6
Average			29*	91.3
1000	1 1/2	Dow A-506	5	78.2
"	"	Dow A-510	7	76.8
"	"	Carbowax	9	85.3
"	"	DuPont IN 6065	7	72.9
"	"	DuPont IN 4311 A9	7	71.2
"	"	DuPont IN 6065 A7	5**	89.3**
"	"	DuPont IN 6065 A9	5**	52.7**
"	"	Weedone	7	72.4
"	"	Weedicide tablets	5	90.3
"	"	Weedicide liquid	1	100.0
"	"	Chipman, 2,4-D Week K.	3	89.1
"	"	Deeweed No. 1	1	95.0
"	"	Deeweed No. 2	1**	5 plants**
"	"	Deeweed No. 3	1**	4 plants**
"	"	Weedanol Ml	1**	10-15 plants**
Average			52*	83.1
1000	2 1/4	Dow A-506	4	77.6
"	"	Dow A-510	4	92.5
"	"	Carbowax	4	71.2
"	"	DuPont IN 6065	3	81.2
"	"	DuPont IN 4311 A9	3	80.9
"	"	DuPont IN 6065 A7	2**	63.5**
"	"	DuPont IN 6065 A9	5**	52.7**
"	"	Weedone	3	76.8
"	"	Weedicide tablets	2	87.3
"	"	Weedicide liquid	1**	10 Plants**
"	"	Chipman 2,4-D Weed K.	4	86.7
Average			27*	81.8
1500	3/4	Dow A-506	3	96.5
"	"	Dow A-510	2	92.9
Average			5*	94.7
1500	1 1/2	Dow A-506	5	92.4
"	"	Dow A-510	2	98.0
Average			7*	95.2

TABLE 1, BINDWEED, CONTINUED

EXP. 11. CONCENTRATIONS AND RATES OF 2,4-D ON PERENNIAL WEEDS, 1945

Concentration in Parts Per Million	Rate in Gallons Sq. Rod	2,4-D Product	No. of Experiments	Average percent reduction in top growth
2000	1 1/2	Dow A-506	3	91.8
"	"	Dow A-510	2	85.5
"	"	Carbowax	2	84.9
"	"	DuPont IN 6065	3	86.2
"	"	DuPont IN 4311 A9	2	88.9
"	"	DuPont IN 4311 A7	2**	78.9**
"	"	DuPont IN 6065 A9	2**	33.1**
"	"	Weedone	2	85.1
"	"	Chipman 2,4-D Weed K.	1	79.5
Average			15*	86.0
Pure	4 lbs.	Sodium Chlorate	5	68.2

* Total number of experiments averaged
**Not included in the average.

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Hoary cress, (Leipdium draba)

The results, in general from 2,4-D on hoary cress were poor. The highest average percent reduction of top growth was 84.2. It was the average of six experiments with 1000 ppm and 2 1/4 gallons per square rod. The summary of average data from the concentration and rate study on hoary cress is as follows:

1000 ppm	3/4 gal. per sq. rod	3	experiments	66.7%	reduc. top growth
"	1 1/2 " " " "	22	"	57.9%	" " "
"	2 1/4 " " " "	6	"	84.2%	" " "
1500 ppm	3/4 gal. per sq. rod	1	experiment	0.0%	" " "
"	1 1/2 " " " "	2	"	75.0%	" " "
"	2 1/4 " " " "	2	"	81.2%	" " "
2000	3/4 gal. per sq. rod	12	experiment	46.4%	reduc. top growth

(Averaged data included in Table 2)

The tendency was for reduced effect from 2000 ppm as compared with 1500 ppm., the same as was true of Bindweed. The data in Table 2 do not apparently indicate any consistent trend in favor of any one product over the others. These data are extremely variable.

(See Table 11 on page 24)

TABLE 2, HOARY CRESS

EXP. 11. CONCENTRATION AND RATES OF 2,4-D ON PERENNIAL WEEDS, 1945

Concentration in Parts Per Million	Rates in Gallons Sq. Rod	2,4-D Product	No. of Experiments	Average percent reduction in top growth
1000	3/4	Dow A-510	1	51.0
"	"	Carbowax	1	77.5
"	"	Weedone	1	71.5
Average			3*	66.7
1000	1 1/2	Dow A-506	3	41.3
"	"	Dow A-510	3	70.3
"	"	Carbowax	5	68.6
"	"	DuPont IN 6065	2	71.5
"	"	DuPont IN 4311 A9	2	31.0
"	"	DuPont In 6065 A7	2**	77.5**
"	"	DuPont In 6065 A9	2**	71.5**

TABLE 2, HOARY CRESS, CONTINUED

EXP. 11. CONCENTRATION AND RATES OF 2,4-D ON PERENNIAL WEEDS, 1945

Concentration in Parts Per Million	Rates in Gallons Sq. Rod	2,4-D Product	No. of Experiments	Average percent reduction in top growth
1000	1 1/2	Weedone	4	71.6
"	"	Weedicide tablets	3	51.3
Average			22*	57.9
1000	2 1/4	Dow A-506	3	52.6
"	"	Dow A-510	1	90.0
"	"	Carbowax	1	95.0
"	"	Weedone	1	98.5
Average			6*	84.2
1500	3/4	Dow A-506	1	0.0
1500	1 1/2	Dow A-506	2	75.0
1500	2 1/4	Dow A-506	2	81.0
2000	1 1/2	Dow A-506	3	58.7
"	"	Dow A-510	1	12.0
"	"	Carbowax	2	62.5
"	"	DuPont IN 6065	1	53.0
"	"	DuPont IN 4311 A9	1	65.0
"	"	DuPont IN 6065 A7	1**	85.0**
"	"	DuPont IN 6065 A9	1**	18.0**
"	"	Weedone	2	49.5
"	"	Weedicide tablets	2	24.0
Average			12*	46.4
Pure	4 lbs.	Sodium Chlorate	2	12.0

* Total Number of Experiments Averaged
**Not included in the average.

Leafy Spurge (Euphorbia esula)

The results from experiments with 2,4-D on leafy spurge varied considerably from station to station. In one set of experiments at Melita, Manitoba, the percentage reduction of top growth from 1000 ppm. to 3/4 gallon per square rod varied from 40.0 to 80.0. In another set of experiments from Melita, Manitoba, the percentages reducation of top growth from 1000 ppm at 1 1/2 gallons per square rod varied from 60.0 to 80.0 at 1500 ppm and 1 1/2 gallons, the range was from 72.0 to 83.0, and at 2000 ppm and 1 1/2 gallons the percentages varied from 52.0 to 84.0.

At Ottertail County, Minnesota, 1000 ppm at 1 1/2 gallons per square rod, the percentages varied from 44.0 to 98.0. With 1500 ppm at 1 1/2 gallons, the range was from 22.0 to 98.0 and at 2000 ppm and the same rate, the reduction varied from 30.0 to 98.0 percent.

At Saskatoon, Saskatchewan, 100.0 percent reduction of top growth of leafy spurge was reported from applications of 1000 ppm at 1 1/2 gallons per square rod. The data averaged for all locations, by concentrations and rates, appears in Table 3, of this page.

TABLE 3, LEAFY SPURGE

EXPERIMENT 11. CONCENTRATION AND RATE OF 2,4-D

Concentration in Parts Per Million	Rate in Gallons Sq. Rod	2,4-D Product	No. of Experiments	Average percent reduction in top growth
500	1 1/2	Dow A-506	1	84.0
1000	3/4	Dow A-506	1	40.0
"	"	Carbowax	1	80.0
"	"	DuPont IN 6065	1	60.0
Average			3*	60.0

TABLE 3, LEAFY SPURGE, CONTINUED

EXPERIMENT 11. CONCENTRATION AND RATE OF 2,4-D

Concentration in Parts Per Million	Rate in Gallons Sq. Rod	2,4-D Product	No. of Experiments	Average percent reduction in top growth
1000	1 1/2	Dow A-506	2	81.0
"	"	Dow A-510	1	84.0
"	"	Carbowax	2	90.0
"	"	DuPont IN 6065	1	98.0
"	"	DuPont IN 6065 A9	1**	76.0**
"	"	Weedone	1	60.0
"	"	Weedicide	1	65.0
"	"	Deeweed No. 1	1	98.0
"	"	Deeweed No. 2	1	98.0
"	"	Dow A-514	1	44.0
Average			11*	79.8
1000	2 1/4	Dow A-506	1	80.0
1500	3/4	Dow A-506	1	78.0
1500	1 1/2	Dow A-506	2	89.0
"	"	Dow A-510	1	96.0
"	"	DuPont In 6065	1	98.0
"	"	Deeweed No. 1	1	98.0
"	"	Dow A-514	1	22.0
Average			6*	80.6
1500	2 1/4	Dow A-506	1	81.0
2000	1 1/4	Dow A-506	2	59.0
"	"	Dow A-510	1	98.0
"	"	Carbowax	1	84.0
"	"	Weedone	1	65.0
"	"	Weedicide tablets	1	52.0
"	"	Dow-A-514	1	30.0
Average			7*	64.7
Pure	4 lbs.	Sodium Chlorate	1	80.0

* Total number of experiments averaged
**Not included in the average.

The data averaged by concentrations and rates do not appear as satisfactory as the results from individual products in that the products varied considerably in their effectiveness on Leafy Spurge. In general, there is little difference in effectiveness between the lower and heavier concentrations and rates. It is very doubtful if the advantages that appear in the data for any one product over another are as real as apparent.

Russian Knapweed (Centurea picris)

Two cooperators reported on Russian Knapweed. At Calgary, Alberta, treatments with Dow A-506, 2,4-D in Carbowax, Weedone and Weedicide showed no effect on the plants from any concentration or rate. At Touhy, Nebraska, the highest percentage reduction was 36.0 from 1000 ppm and 1 1/2 gallons per square rod. The indication is that Russian Knapweed is very tolerant to 2,4-D.

Johnson grass (Sorgum halepense)

Two cooperators reported on Johnson grass. At Hays, Kansas, Dow-A-506, 2,4-D in Carbowax, Weedone, and DuPont in 6065 were applied at concentrations of 1000, 2000 and 3000 ppm and 1 1/2 gallons per square rod. No reduction was observed. At Robbs, Illinois, 2,4-D in Carbowax and Weedone were applied at 1000 ppm and 1.0 gallons per square rod with no reduction of the Johnson grass.

Franseria ssp.

Franseria tomentosa, at Larned, Kansas, was treated with Dow A-506, 2,4-D in Carbowax, Weedone and DuPont in 6065 at concentrations of 1000 and 2000 ppm and at the rate of 1 1/2 gallons per square rod. The percentages reduction of top growth ranged from 64.0 to 90.0 at 1000 ppm and 87.0 to 96.0 at 2000 ppm.

Franseria discolor at Holdrege, Nebraska was treated with Dow A-510, 2,4-D and Carbowax, and Weedone at 1000 ppm and at the rates of 3/4, 1 1/2, and 2 1/4 gallons per square rod. The percentages reduction of top growth varied from 0.0 to 60.0 at 3/4 gallon; 0.0 to 50.0 at 1 1/2 gallons and 0.0 to 60.0 at 2 1/4 gallons per square rod. In general, the results were much more satisfactory on Franseria tomentosa than on Franseria discolor. Whether this is a species difference, or due to the conditions of the experiments, is not known.

Hedge bindweed (Convolvulus sepium)

Three cooperators reported on Hedge bindweed. At Winnipeg, Manitoba, 100.0 percent reduction of top growth was observed from all 2,4-D products at all concentrations and rates. At Redwood County, Minnesota, reductions of top growth varied from 95.0 to 100.0 with all concentrations and rates effective. DuPont IN 6065 A9 was less effective than the other products resulting in 70.0 percent reduction from 1000 ppm and 1 1/2 gallons per square rod. At Columbus, Ohio, Dow A-510 was applied at 1 1/2, 2.0 and 3.0 gallons per square rod of 1500 ppm solution. All rates resulted in 100.0 percent reduction of the plants.

Evening primrose (Oenothera biennis)

At Robbs, Illinois, evening primrose treated with 2,4-D in Carbowax and Weedone reduced the top growth of 98.0 and 95.0 percent, respectively. At Columbus, Ohio, this weed was reduced by 100.0 percent from treatments with Dow A-506 at 1500 ppm and 1 1/2 and 2.0 gallons per square rod.

Horse nettle (Solanum Carolinense)

At Columbus, Ohio, horse nettle was little affected by 1000 and 1500 ppm at rates up to 3.0 gallons per square rod. At Stillwater, Oklahoma, 2,4-D stopped the growth and fruiting of horse nettle, but did not kill the plant.

A number of other perennial and biennial weeds were treated and studied by the various cooperators. Some of these will be listed and the effect of 2,4-D noted.

Weed	Location	2,4-D Application Conc.	Rate	Gen. Effectiveness (% Reduction)
Bull thistle - Cirsium lanceolatum	Robbs, Illinois	Not indicated		97 to 99
Dogbane - Apocynum cannabinum	Hays, Kansas	500	1 1/2	97
		1000	"	80 to 98
		1500	"	100
		2000	"	78 to 100
Swamp smartweed - Polygonum coccineum	Hays, Kansas	1000	"	0
		2000	"	40
Milkweed - Ascepias syriaca	Redwood Co.,Minn	500	"	0
		1000	"	0 to 2
		1500	"	1
Tanweed - Polygonum muhblenbergii	Petersburg,Neb.	1000	"	27.5
Man-of-the-earth-Ipomea pandurata	Zanesville,Ohio	Not indicated		90
Jerusalem artichoke-Helianthus tuberosus	Columbus, Ohio	1000	2.0	100
		1500	1 1/2	100
Chicory - Cichorium intybus	Columbus, Ohio	1500	2.0	90 to 100
Quack grass - Agropyron repens	Columbus, Ohio	2000	4.0	90 to 100

Weed List Continued

Weed	Location	2,4-D Application Conc. Rate		Gen. Effectiveness (% Reduction)
Oxeye daisy - Chrysanthemum leucanthemum	Charlottetown, P.E.I.	500-2000	3/4-2-1/4	0
Blue lettuce - Lactuca pulchella	Saskatoon, Sask.	1000	1 1/2	98
Poverty Weed	" "	"	1 1/2	97
Texas blueweed - Helianthus cilaris	Amarillo, Texas	500	"	60
		1000	"	72 - 89
		"	2 1/4	46 - 95
		1500	1 1/2	90 - 92
		"	2 1/4	62 - 94

I think that covers my part of the Report, and Dr. Bakke will carry on from here.

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Meeting ceased for a few moments until photograph was taken.

EXPERIMENT 11, DR. A. L. BAKKE, AMES, IOWA

Mr. Chairman, I have a report on three weeds that I will try to summarize and give the outstanding points in connection with the reports that have come in.

On POISON IVY, the Reports were from four different stations--Dixon Springs, Illinois, Ninette, Man., Duluth, Minnesota, and Columbus, Ohio.

We find that the results, generally, in the case of Poison Ivy, showed a rather high percentage of kill, as far as the above-ground parts were concerned. Mr. Hanson has stressed the importance of the designation of "kill" and we have done that by the appearance of the above-ground, or surface part of the plant.

Dixoh Springs: Dow A-506, 1000 ppm, 6/6 3/4 gal. 90% kill of above-ground parts
Dow A-510, 5/24 - 3/4 gal., 100% kill of above-ground parts
Weedone, 5/24 - 3/4 gal. 80% kill of above-ground parts
Dow G-506, 5/24 - 3/4 gal. 80% kill of above-ground parts
Anmate, 5/24 - 1 gal. 100% kill of above-ground parts

Ninette, Man.: 2,4-D Carbowax, 1000 ppm 3/4 gal. 100% of above-ground parts
DuPont IN 6065, 7/14- 3/4 gal. 99% kill of above-ground parts

Duluth, Minn.: Dow A-506, 1000 ppm., 3/4 gal. 7/14, 99% kill of above-ground parts
Dow A-506, 1500 ppm, 99% kill of above-ground parts
DuPont No. 1, 1000 ppm, 90% kill of above-ground parts

Columbus,Ohio: Dow A-506, 5/19 - 2000 ppm 2½ lbs., 100% of above-ground parts
Dow G-516, 6/27 3½% Heavy
100% kill of above-ground parts - Range 20%, thinned, 50% A 506 3/4 gal.

On PERENNIAL SOW THISTLE, we have the reports of three different stations -- Winnipeg, Canada, Meeker County, Minnesota, and Saskatoon, Saskatchewan.

7/11-Dow A-510--1000 ppm 3/4 gal. 90% kill above-ground parts
2,4-D-Carbowax, 1000 ppm, 3/4 gal. 95% kill above-ground parts

8/16-Meeker Co., Minnesota, Dow A-506, 1000 ppm 1 1/2 gals. 100% kill of above-ground parts

Dupont No. 1--100 ppm, 1 1/2 gals., 87.5% kill of above-ground parts
Number 2--1500 ppm, 1 1/2 gal., 90% kill of above-ground parts
2000 ppm, 3/4 gal., 100% kill of above-ground-parts
Deeweed No. 1 1500 ppm, 1 1/2 gal., 90% kill of above-ground parts

Dow-G-526, 5% 5 lb., 100% kill of above-ground parts

7/4 - Saskatoon, Can., 2,4-D Carter, 1000 ppm, 1 1/2 gal., 100% kill of above-ground parts
Refined 2,4-D, 8800 ppm, 1 1/2 gal., 100% kill of above-ground parts

On CANADA THISTLE, we had reports from Muncie, Indiana; Crystal Lake, Iowa; Winkler, Manitoba; Meeker Co., Minn.; Wahoo, Nebraska; Saskatoon, Saskatchewan; and Madison, Wisconsin. The results varied considerably all the way from a point where they had no kill at all, to the point where we had 100% kill.

From Muncie, Indiana, Dow A-510 on June 18, in the prebud stage, with a concentration of 500 ppm, 3/4 gal. per square rod, 10.6% above-ground parts killed; 1 1/2 gallons per square rod, 53.2% killed; 2 1/4 gallons, 17.3% killed. With a concentration of 1000 ppm, the respective percents were 10.3, 29.3 and 57.1. Sodium Chlorate was 98.4%.

From Winkler, Man., June 16, 1945:

Dow A-506 8/27 3/4 gal. per sq. rod, 60% of above-ground parts killed
2-42 Carbo. 70% of above-ground parts killed
DuPont No. 1 35% of above-ground parts killed
DuPont No. 2 20% of above-ground parts killed

From Meeker Co., Minn., June 29, 1945:

Dow A-506 1 1/2 gals. 500 ppm, 86% above-ground parts killed
2 1/4 gals. 98% of above-ground parts killed
Dow A-506, 1000 ppm 3/4 gal., 95% above-ground parts killed
2 1/2 gals...97% above-ground parts killed
2 1/4 gals...96% above-ground parts killed
2,4-D Carbowax..3/4 gal. 96% above ground parts killed, 500 ppm.
DuPont No. 1 3/4 gal. 1000 ppm, 87% above-ground parts killed
DuPont No. 2 2 1/4 gal., 8/16 1000 ppm 100% killed
DuPont No. 3 2 1/4 gal., 1000 ppm 94% killed
DuPont No. 4 2 1/4 gal., 1000 ppm 95% "
Weedone, 2 1/4 gal., 1000 ppm 77% "
Dow Weed No. 1 1 1/2 gal., 1500 ppm, 100% killed
Dow Weed No. 2 " " 1500 ppm, 99% "
Dow Weed No. 3 " " 1500 ppm, 98% "
Dow A 514 " " 1000 ppm, 83% "
Dow Cr. 526 5% 5 lbs., 99% above-ground parts killed
Dow Cr. 538 5% 5 lbs., 99% above-ground parts killed

From Wahoo, Nebraska, June 28, 1945:

Dow A-510 3/4 gal. 1000 ppm 72% above-ground parts killed
1 1/2 " 59% above-ground parts killed
2 1/4 " 71% above-ground parts killed
Weedone, 3/4 " 1000 ppm 64% above-ground parts killed
1 1/2 " 69% above-ground parts killed
2 1/4 " 83% above-ground parts killed

From Madison, Wisconsin:

500 ppm, 1 1/2 gal. 0% above-parts killed
1000 ppm, 2 1/4 gal. 0% above-parts killed
1500 ppm, 3/4 gal. 0% above-parts killed
1 1/2 " " " " "
2 1/4 " " " " "
2000 ppm 1 1/2 " " " " "

6/14 2,4-D Carbowax, 1000 ppm, 3/4 gal. 25% above-ground parts killed
DuPont No. 1, 1000 ppm, 3/4 gal. 25% above-ground parts killed
DuPont No. 2, 1000 ppm, 3/4 gal. 25% above-ground parts killed
DuPont No. 3, 1000 ppm, 3/4 gal. 25% above-ground parts killed
DuPont No. 4, 1000 ppm, 3/4 gal. 25% above-ground parts killed

Weedone 3/4 gal., 1000 ppm, 25% above ground parts killed

Weedicide tablets, 1000 ppm, 3/4 gal. 25% of above-ground parts killed

Chipman, 1000 ppm, 2 1/4 gal. 0% above-ground parts killed

From Crystal Lake, Iowa, 7/13/45 Bud Stage, Heavy stand 3':

Concentration: 1000 ppm, used 2 1/4 gal. 9/21
Weedone, Dow-A-510, 2,4-D Carbowax, DuPont No. 1 and 2 were on a par, with only a few plants coming up less than 25 per sq. rod. Approximately 95% kill, as far as plants are concerned. All plants sprayed were killed.

From the data submitted, the results were perhaps insufficient. Those presented were in many cases conflicting. It is evident that a weed like Canada thistle is hard to eradicate.

Concentrations of 2,4-D compounds where only 3/4 gallon of a concentration of 500 ppm. per square rod are inadequate. It is necessary to have sufficient material to cover all the aerial surface; 1 1/2 gals. per square rod are suggested.

It would seem as the best time to make applications is during active growth, although rather good results have been obtained during later summer stage. Where plants make heavy seeding, spraying in late summer cannot be advocated.

It is clear that in the case of firmly attached perennial weeds, two treatments a year are necessary.

Definite results cannot be obtained until there has been ample time for recovery next year. In all probability the same general statements may also be applied to perennial sow thistle.

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EXPERIMENT 111, 2,4-D, THE EFFECT ON ANNUAL WEEDS,
MR. E. A. HELGESON, FARGO, NORTH DAKOTA

We have made a list of these Annual Weeds and I am not going to read them now, but you will find them in the chart following this report.

At Lamberton, Minnesota, flax, wheat, barley, oats, and peas heavily infested with common ragweed, wild buckwheat, lambs-quarters and green and yellow foxtail were given replicated treatments of several concentrations of Dow 24, 2,4-D in Carborax, DuPont IN-6065 (No. 1), Sinox or Dow G-506 on May 18, when mustard plants were in 2-4 leaved stage and on June 11 when mustard was developing a woody stalk. The 2,4-D formulations did not injure wild buckwheat or the foxtails at either date of applications. Mustard, ragweed and lambs quarters were well controlled by all rates and formulations of the 2,4-D at the later date of treatment, when temperatures were 60 to 80° F., but poor control was secured by the early application when temperatures were below 65° F. At the higher temperatures Sinox and Dow G-506 also gave good control of wild buckwheat, which was uninjured by the 2,4-D formulations. No herbicide tested had any marked effect on either species of foxtail.

The 2,4-D formulations used caused heavy injury to flax and peas. Sinox and Dow G-506 did not injure the flax and pea crop.

Pavlychenko, of Saskatchewan reports excellent kills of Indian, ball, hare's ear and common mustard with several 2,4-D formulations, but little or no effect on wild buckwheat; lambs-quarters easily killed when small, but resistant when mature.

Darcovich, of Regina, Saskatchewan reports better control of common mustard with Sinox and Dow G-506 than with any rate of the several 2,4-D compounds tested at his station. The Central Experimental Farm at Ottawa, Ontario reports excellent control of common mustard with Dow A-510, DuPont 1 and 2 and 2,4-D and Carborax at 500 ppm. The Melfort, Saskatchewan Station reports kills of common mustard with several formulations of 2,4-D at 500 ppm. than with a standard solution of Dow G-506.

Vehmeyer of the North Platte Station in Nebraska, reports a very comprehensive study of the effects of several 2,4-D formulations on Kochia scoparia: puncture vine (Tribulus terrestris L.) and prickly lettuce, (Lactuca scariola L.) He reports an excellent kill of Kochia at all stages of growth with 1000 ppm. of all 2,4-D herbicides tested. Puncture vine treated at full bloom with 2000 ppm of DuPont No. 11 was entirely eliminated. Prickly lettuce was completely controlled with Dow A-510 or 2,4-D in Carborax at 250 to 1000 ppm. concentrations of spray solution when the plants were 1 to 3 feet high.

H. E. Woods of the Department of Agriculture of Manitoba, reports effective control of Iva xanthifolia with several 2,4-D formulations when treated in July, but that this weed was much more resistant when treated in late August when more mature and woody. He reports no damage to gumweed, Grindelia squarrosa; little effect on blue lettuce, Lactuca pulchella; excellent kill of cockle burr, Xanthium spp.; and complete kill of narrow-leaved nettle with similar treatments. Frenchweed, wild mustard and chickweed scattered in these plots were more successfully eliminated by the same treatments.

A. G. Kusch, of the Dominion Station at Scott, Saskatchewan, submitted the most complete report on Frenchweed or stinkweed, Thlaspi arvense. He reported that several 2,4-D formulations tested at 500 ppm. as a spray solution killed 60 percent or less of the stinkweed, whereas Sinox eliminated 95 percent of this weed. Dow G-506 was reported as less effective than any of the other herbicides tested. Reports of spot treatments from several other Dominion cooperators indicate that various 2,4-D formulations, while not completely killing stinkweed, caused sufficient injury to prevent flowering and fruiting. At Lamberton, Minnesota, all of the 2,4-D formulations tested, killed or severely injured stinkweed. Sinox and Dow G-506 gave better control than any of the 2,4-D formulations. At Swift Current, Saskatchewan, Sinox gave no effect on stinkweed, whereas, the heavier rates of the 2,4-D compounds gave excellent results.

The Swift Current Station reports the most complete tests on Russian thistle, Salsola spp.; no effect was observed from the use of Sinox. Dow A-506 gave no apparent control, except at high concentrations. Weedone, or 2,4-D in Carborax gave good control at medium and high concentrations. Scattered reports from other stations indicate that Russian thistle is quite tolerant of the 2,4-D sprays.

Timmons of Hays, Kansas, reports successfully controlling wild lettuce and fleabane in a buffalo grass seed field with a number of 2,4-D formulations at various rates of application. Good control of lettuce was obtained with early and late applications, while early applications gave better control of fleabane than when applied when the grass was in bloom. Sinox gave excellent control of fleabane at either date of application; Dow G-506 only at the late treatment date. Sinox gave good control of lettuce when early treatment was used, only 50 percent control at the time the grass was fruiting. Dow G-506 gave poor control of wild lettuce.

The Charts on the "Effect of several 2,4-D Formulations or Selective Herbicides on Common Mustard at Five Stations" and "The Effect of 2,4-D Formulations and Selective Herbicides on Several Annual Weeds," will complete this report.

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EXP. V, TOLERANCE OF CROP PLANTS TO SPRAY SOLUTIONS OF 2,4-D AND OTHER SELECTIVE HERBICIDES - DR. L. M. STAHLER, LAMBERTON, MINN.

In general, insufficient work has been done with these new herbicides to establish their role as selective sprays for the control of annual weeds in grain, vegetable or forage crops. Data from most stations were only fragmentary, covering such a wide range of crops, stages of growth, herbicides and rates of application that no summary of the data is possible. Most of the available tabular data are included in tables 1-10 Pages 40 to 50. It should be emphasized that many of the data were secured from single applications and results are often only visual measurements or estimations.

As with the weedy plants, crop or ornamental plants varied greatly in their tolerance of the various herbicides tested and reported.

Alfalfa, sweet clover and red clover was severely injured by treatments of the various 2,4-D herbicides reported from Nova Scotia, Kansas, Nebraska, Indiana, Ohio, and Minnesota. The degree of injury in general increased with the concentrations of the herbicides used. Rates as low as 500 ppm. were reported to eliminate from 40 to 90 percent of these crops. Complete elimination was reported where concentrations were increased to 1000 or 1500 ppm. Limited available data indicated no marked difference in the tolerance of these crops to the various 2,4-D formulations tested. Hope, of Nova Scotia reported no injurious effects to clover from applications of Dow G-506 that eliminated common mustard.

White clover in lawns has likewise been reported susceptible to injury when treated with the 2,4-D herbicides. Lee, of Indiana, reports from 25 to 50 percent injury to white clover on lawns treated with 500 ppm. of most of the available 2,4-D compounds. He reported a greater injury to white clover where 1 1/2 gallons of spray

solution per square rod, than where 3/4 gallon was used, but showed no difference in injury between concentrations of 500, 1000, and 1500 ppm. for any one herbicide. Weedone at high concentrations gave more injury than comparable herbicides. Sinox and Dow G-506 gave no permanent injury. He reported no seasonal variations in tolerance of white clover to the herbicides.

At Lamberton, Minnesota, spring, summer, and fall treatments of white clover in lawns showed this plant to be very readily killed by the 2,4-D herbicide in early spring, but more tolerant in summer and fall. In all treatments, high rates of applications were more detrimental than low rates of the same compound. The injury to white clover caused by spring treatments had been entirely repaired by seedling plants by August. No advantage for any one 2,4-D formulation can be shown for the data received.

No injury is reported by Lee of Indiana, to blue grass with treatments of a variety of 2,4-D herbicides at rates of from 500 to 2000 ppm., using 3/4 to 1 1/2 gallons of solution per square rod. The Minnesota reports indicate considerable damage to blue grass with high concentrations of several compounds in spring applications and with 1 1/2 gallons per square rod of a solution of Dow A-510 at 2000 ppm. for both summer and fall applications.

Erickson of South Dakota, Helgeson of North Dakota, and Hanson of Nebraska report no injury to blue grass, using several 2,4-D compounds at rates required to eliminate dandelions and plantain.

Seedling and established orchard grass treated with 1000 to 1500 ppm. of several 2,4-D formulations by Willard of Ohio showed no injury. Domestic ryegrass at this station treated with 1 1/2 gallons per square rod at a concentration of 2,000 ppm., likewise showed no injury.

Brome grass, treated with Dow A-510, 1000 ppm. at the Lamberton, Minnesota station was not injured.

Timmons of Hays, Kansas, reports treatments of Buffalo grass, Buchloa dactyloides, with 2,4-D formulations at several rates to control annual weeds, in general increased yields of seed and hay when treatments were made in earth growth stages, but decreased yields of seed when the treatments were made when the grass was setting seed. Forage yields were increased by the late applications. Decrease of seed yield is ascribed to the high percentage of empty burrs resulting from the 2,4-D treatments. Plots treated with Sinox at both dates showed greater increases in seed and hay yield than for any of the 2, 4-D formulations.

Pavlychenko of Saskatchewan, reports injury to flax, when treated with several 2,4-D formulations. The Station at Swift Current, Saskatchewan reported retardation in growth of flax treated with 2,4-D formulations, but no permanent injury.

At Lamberton, Minnesota, tests of the several available 2,4-D formulations and selective dinitro compounds indicated that the former herbicides were almost as detrimental to the flax plants as to the annual weeds. Treatments made when the flax plants were 1 to 3 inches high, were not as detrimental, as when applied later to flax six inches high. All treatments, except Sinox and Dow G-506 severely injured the flax, and greatly reduced yields. Both Sinox and Dow G-506 gave increased yields of flax seed.

Yields of wheat, oats, and barley, treated when two to four inches, or at five to eight inches, at Lamberton, Minnesota were not markedly influenced by either the 2,4-D formulations, or the two selective herbicides. Oats showed a definite retardation in flowering when treated with the higher rates of 2,4-D compounds. Wheat and barley showed no visible effects.

Lee of Indiana, treating bindweed in oats 8 to 10 inches high with Dow A-510 at 1000 ppm. and several rates of application, reported double or more increase in yields of grain, as compared to untreated bindweed area in spite of some injury to the oats plants.

Hood Wills of Perryton, Texas, reported no injury to wheat treated when in full growth with several 2,4-D compounds at rates recommended by the manufacturers. The rates used successfully depressed bindweed and blue weed in the wheat. Willard of Ohio, reports no injury to oats treated when in the milk stage with 1500 ppm. of Dow A-506. From Swift Current, Saskatchewan, came reports of no injury to wheat treated with various rates and formulations of 2,4-D and selective herbicides. The Central

Experiment Farm at Ottawa, Ontario, reports injury to oats from Sinox, but no injurious effect from the 2,4-D formulations that successfully eliminated wild mustard in this crop.

Timmons of Hays, Kansas reports no injury to jointing rye, oats, or barley treated with 2,4-D in Carbowax at 1000 ppm. Unreplicated treatments covering a variety of compounds and rates of 2,4-D applied to wheat in boot, to control Hoary Cress, Lepidium draba, at this station resulted in a great variability of grain yields. While these data are too variable and meager to establish any relationship between the observed injury and the formulations or rates of application used, they do indicate that the grain plants are not immune at all stages of growth to the 2,4-D herbicides. Hope of the Kentville Nova Scotia Station, likewise reported definite injury to seedling oats when treated with several 2,4-D Compounds.

Treatment of corn at various stages of growth at Indiana, Kansas, Minnesota, and Ohio has resulted in some injury to the corn plants. Timmons of Kansas, reports greater injury, as reflected in grain yield to corn, when treated with 1500 to 2000 ppm. of the same herbicide. Corn was treated when 18 inches tall. Willard of Ohio, reports quite severe injury to corn 24 to 54 inches tall when the entire plants were sprayed with heavy rates of several 2,4-D formulations, but no injury when equally heavy treatments were sprayed only on the base of tasseling corn to control weeds in the hill. At Lamberton, Minnesota no measurable injury resulted from spraying Dow A-510 at 1000 ppm. on weeds in corn hills when corn was 8 inches tall, or silking. The early applications definitely retarded development of brace roots and resulted in considerable lodging of the mature corn. Lee of Indiana, also reported lodging, but no material reduction in yield where corn hills infested with bindweed were sprayed with Dow A-510 at 1000 ppm.

Reports indicate that most of the annual truck and garden crops are very sensitive to any of the 2,4-D formulations.

At Hays, Kansas, string beans, peas, carrots, lettuce, onions, spinach, and tomatoes were heavily damaged with 2,4-D in Carbowax at 5000 ppm. and completely destroyed at higher spray concentrations. Bakke, of Iowa, reported heavy damage to onions treated with several 2,4-D formulations, or with Sinox. Willard, of Ohio, reports heavy injury to asparagus treated with high concentrations of several 2,4-D formulations. At Lamberton, Minnesota, table beets, sugar beets, carrots, onions, string beans, asparagus, and rhubarb were heavily damaged, or killed by spray applications of Dow A-510 at 1000 ppm. Iris and gladiolus were severely damaged by like treatments. Commercial canning peas treated at 2 to 4 inches or 4 to 12 inches, with various formulations and rates of 2,4-D and Sinox, or Dow G-506 were severely damaged by the lighter applications of 2,4-D and completely killed by the heavier applications. Sinox and Dow G-506 gave no marked injury to the growing peas, but neither gave a marked increase in harvested fruit.

At Ohio and Minnesota, wild strawberries were reported very resistant or immune to 2,4-D.

In Minnesota, White Pine, Pinus strobus; Jack Pine, Pinus banksiana; White spruce, Picea canadensis; Black spruce, Picea mariana; Red Cedar, Juniperus virginiana, and Dogwood, Cornus species, are reported uninjured by 1000 ppm. spray solutions of Dow A-510. Seedlings of American Elm, Hard and Soft Maple, Cottonwood, and Alder, Alnus americana; were entirely killed with spray applications of several 2,4-D formulations at 1000 ppm. in early spring, but reacted more slowly when so treated in summer and fall. Sumac Rhus glabra was killed with 1000 ppm. of several 2,4-D compounds in spring and early summer, but was somewhat resistant to fall applications.

CONCLUSIONS

While reports on the use of any of the 2,4-D formulations available in 1945 as selective herbicides for the control of weeds in growing crops are in general inconclusive, they do indicate:

1. Grass crops, such as grain, corn, brome, rye grass, and buffalo grass, while comparatively tolerant to moderate rates of application, are susceptible to serious injury at certain periods of growth, or when excessive rates of application of 2,4-D compounds are used. There is little or no evidence that any one form or formulation of 2,4-D is less injurious than others tested. Sinox and Dow G-506 caused little or no injury to grass crops and are about equal to the 2,4-D formulations in controlling most annual weeds.

2. Use of any of the 2,4-D formulations to control weeds in flax or canning peas was definitely hazardous to the treated crops.

3. Reports on the reactions of various vegetable and truck crops to 2,4-D applications indicate that the use of these herbicides on, or near such crops was highly hazardous.

4. The great variability in reaction of different species of woody and herbaceous perennial plants to spray solutions of 2,4-D formulations indicated that caution should be exercised in treating lawns or weeds near ornamental plantings.

Tables 1 to 10 on pages 40 - 50 complete this report.

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TABLE 1

THE EFFECT OF SEVERAL 2,4-D AND SELECTIVE HERBICIDES ON CEREALS, FLAX, PEAS, WHITE CLOVER AND BLUE GRASS AT LAMBERTON, MINNESOTA, 1945

Herbicide	Concentration ppm.	Gals. per sq. rod.	Percentage Reduction in yield of: Peas	Flax	Wheat	Oats	Barley	% injury to: Blue Grass Spring	Summer	Fall	% injury to: White Clover Spring	Summer	Fall
Dow A-506	500	3/4	65	29.0	3.0	0	0	0	0	0	15	10	2
"	500	1½	82	13.0	1.0	2.0	0	0	0	0	10	10	6
"	1000	3/4	95	52.00	2.2	1.0	2.0	0	0	0	40	5	8
"	1000	1½	93	84.0	0	0	0	5	0	0	82	22	8
"	1500	3/4	100	92.0	0	0	0	8	0	0	80	8	15
"	1500	1½	100	92.0	0	0.5	1.5	12	5	2	90	15	35
Carbowax.	1000	3/4	100	87.0	0	0	0	5	0	5	92	85	86
"	1000	1½	100	67.0	0	0	0	15	0	0	99	4	95
DuPont 1	500	3/4	80	84.0	0	0	0	0	0	0	72	10	2
"	500	1½	72	82.0	0	0	0	12	0	0	95	6	6
"	1000	3/4	93	88.0	0	0	0						3
"	1000	1½		94.0	0	0	4.0						
Weedone	1000	3/4						8	0	0	80	10	22
"	1000	1½		0		0		8	0	0	99	24	6
Sinox	Standard	5/8	5	0	0	0		0	0	0	75	58	0
Dow G-506	Standard	5/8	0	0	0	0		0	0	0	72	24	0

Note: Flax, peas and cereals treated in spring

TABLE 2

OBSERVATIONS ON THE EFFECT OF 2,4-D ON CROP ORNAMENTAL PLANTS, LAMBERTON, MINNESOTA, L. M. STAHLER, COOPERATOR, 1945

Crop and Stage of growth	Date Treated	Chemical used	Conc. ppm.	Rate gal. sq.rod	% Injury to Other crops	Notes
Alfalfa 4 in.	May 14	Dow 24	500	1½	85	
Bloom	June 28	Dow 24	500	"	64	
Bloom	June 28	Dow 24	1000	"	98	
2nd Bloom	Jul. 18	Dow 24	1000	"	85	All escaped plants yellow
Sweet clover	May 14					
8 in.	May 14	Dow 24	500	"	70	
8 in.	May 14	Dow 24	1500	"	100	
Red clover						
4 in.	May 14	Dow 24	1000	"	95	
Soybeans						
6 in.	June 28	Dow 24	1000	"	100	
Table Beets						
Seedlings	June 28	Dow 24	500	"	100	
Sugar beets						
Well rooted	Jul. 18	Dow 24	1000	"	100	
Carrots, Seedlings	Jul. 18	Dow 24	1000	"	100	
String beans, pods	Jul. 18	Dow 24	1000	"	100	
Onions, seedlings	Jul. 18	Dow 24	1000	"	75	Remaining plants N.G.
Tomatoes, first bl.	Jul. 18	Dow 24	500	"	100	
Iris (Tall) pre bl.	June 4	Dow 24	500	"	65	Remaining plants yellow
	June 4	Dow 24	1000	"	100	
Gladiolus pre bl.	Jul. 18	Dow 24	500	"	None	killed, no bloom, poor
	Jul. 18	Dow 24	1000	"	Same	bulb formation
White pine	June 26	Dow 24	1000	"	0	
Jack pine	"	Dow 24	1000	"	0	
White spruce	"	Dow 24	1000	"	0	
Dogwood	"	Dow 24	1000	"	0	
Red cedar	"	Dow 24	1000	"	0	
Brome grass 4-6 in.	May 14	Dow 24	1000	"	0	
Second gr.	Aug. 10	Dow 24	1000	"	0	
Strawberries, wild						
Pre-Bloom	June 12	Dow 24	1000	"	0	
Past Bloom	July 18	Dow 24	1000	"	0	
Asparagus cutting	May 26	Dow 24	1000	"	Almost complete kill, few new	
Rhubarb, full Folliage	July 18	Dow 24	1000	"	100	fall shoots
Corn 8 in.	July 3	Dow 24	1000	"	No app. injury, exc. weak	
" Silking	Aug.16	Dow 24	1000	"	stalks Only base of plant	
					sprayed. No apparent injury	
Millet, German, 8 in.	Aug. 3	Dow 24	1000	"	40	
Seedlings of Am. elm		Dow 24				
Maple and cottonwood	May 18	Dow 24	1000	"	100	
6 in. to 38 in.	Aug. 28	Dow 24	1000	"		

TABLE 3

OBSERVATIONS OF THE EFFECT OF 2,4-D ON CROP PLANTS
OHIO STATE UNIVERSITY, COLUMBUS, OHIO, 1945
C. J. Willard, Cooperator

Crop and Stage of growth	Date Treated	Chemical used	Conc. ppm.	Rate Gals. Sq. rod	% Injury to Crop	Notes
Corn 10"-12" high	6/22	A-506	1500	Heavy	0	Central growing pt. and all leaves well sprayed.
Corn 24"-30" high	7/5	A-506	1500	1 1/2	5	"
Corn 24"-30" high	7/5	S.W.1	1000	1 1/2	10	"
Corn 24"-30" high	7/5	S.W.1	2000	1 1/2	15	"
Corn 48"-54" high	7/17	A-506	2000	1 2/3	10	"
Corn 48"-54" high	7/17	Weedone	2000	1 1/2	90	"
Corn-tasseling	7/23	Weedone	2000	1 1/2	0	Applied to bases of plants and soil only.
Corn silks, dead	8/9	Weedanol	1500	2 1/2	0	All parts sprayed
Corn silks, dead	8/9	A-506	1500	2 1/2	0	" " "
Alfalfa 2nd cutting, 8" high	6/26	A-506	1500	1 1/2	100	No recovery
Red clover, 2nd cutting, 6" high	6/26	A-506	1500	1 1/2	100	No recovery
Soybeans 6"-8" tall	6/22	A-506	1500	1	100	No recovery
Oats-milk	6/22	A-506	1500	2	0	
Asparagus in bloom	7/23	A-506	2000	Heavy	100	Some resprouting, do not know whether roots killed.
Asparagus in bloom	8/1	Weedanol	1500	Heavy	100	do.
Strawberries (Wild)	6/26	A-506	1500	Heavy	0	
Strawbernies (Wild) Jackson, Ohio	7/10	A-510	2000	Heavy	0	
Orchard grass sown April 1	6/22	A-506	1500	1 1/2	0	
Orchard grass sown April 1	6/22	S.W.1	1000	1 1/2	0	
Orchard grass sown April 1	7/31	A-506	1500	2	0	
Orchard grass sown April 1	8/1	Weedanol	1500	2	0	
Sweet clover sown April 1	6/22	A-506	1500	1 1/2	100	
Sweet clover sown April 1	6/22	S.W.1	1000	1 1/2	100	
Sweet clover sown April 1	7/31	A-506	1500	2	100	
Sweet clover sown April 1	8/1	Weedanol	1500	2	100	
Domestic Ryegrass sown April 1	9/26	S.W.1	2000	1 1/2	0	

TABLE 4

OBSERVATIONS ON THE EFFECT OF SEVERAL 2,4-D AND SELECTIVE HERBICIDES USED FOR THE CONTROL OF LAWN WEEDS ON BLUE GRASS AND WHITE CLOVER, PURDUE UNIVERSITY, LAFAYETTE, INDIANA, 1945, O. C. LEE, COOPERATOR

Date	Chemical Used	Conc. ppm	Rate gals. sq. rod	Percent Injury Bluegrass	Percent Injury White Clover
5/21	Dow A-510	500	3/4	0	25
"	"	500	1 1/2	0	40
"	"	1000	3/4	0	25
"	"	1000	1 1/2	0	40
"	"	1500	3/4	0	25
"	"	1500	1 1/2	0	40
"	Carbowax 1500	1000	3/4	0	25
"	"	"	1 1/2	0	40
"	DuPont No. 1	"	3/4	0	25
"	DuPont No. 1	"	1 1/2	0	40
"	DuPont No. 2	"	3/4	0	25
"	DuPont No. 2	"	1 1/2	0	40
"	DuPont No. 3	"	3/4	0	25
"	DuPont No. 3	"	1 1/2	0	40
"	DuPont No. 4	"	3/4	0	Temporary Injury
"	DuPont No. 4	"	1 1/2	0	to White Clover
"	Weedone	"	3/4	0	25
"	Weedone	"	1 1/2	0	50
"	Weedicide	"	3/4	0	25
"	Weedicide	"	1 1/2	0	40
"	Sinox	2.15%	1 1/2	0	Temporary Injury
"	Dow G-506	1%	1 1/2	0	" "

Experiment Using Dow A-510, 500-1000 and 1500 ppm. at rates of 3/4 and 1 1/2 gal. Repeated on 6/29-7/29 and 8/22. No damage to Blue Grass. Injury to Clover about the same on all dates of treatment.

Note: Plants counts not made, damage estimated.

General Information: Oliver C Lee, Purdue University, Cooperator
Lafayette, Indiana

Name of weed or weeds....Dandelion and C. Plantain Competitive Crop, Blue Grass & White Clover
Topography (bottomland, upland) Upland Soil texture (sandy, loam clay) Loam
Soil fertility (high, med. low.) HIGH Soil reaction (PH) 6.5
Soil Moisture (wet, moist, dry) Moist

Weather data at time of application
Humidity (% or other index) 68% Temp. °F 78% Cloudiness Cloudy
Amount received (ins.) 28.04 Time until first rain .11 in. on 5/22

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TABLE 5

OBSERVATIONS ON THE HERBICIDAL EFFECTS OF SEVERAL 2,4-D FORMULATIONS ON CROP PLANTS. PURDUE UNIVERSITY, LAFAYETTE, INDIANA, 1945, O. C. LEE, COOPERATOR

Crop	Time of application: Stage of growth	Date	Chemical Used	Conc. ppm.	Rate gals. sq. rod	Percent injury to dif. crops: to Crop	Bind-weed	Rag-weed	Crop Yield bus/A
Oats	8-10" high	5/25	Dow A-510	1000	3/4	4.8	77.0	100	61.7
Oats	" "	"	"	"	1 1/2	0	99.1	100	66.0
Oats	" "	"	"	"	2 1/4	14	99.8	100	56.1
Oats	Untreated chk., heavy bindweed infestation								22.4
Oats	Untreated chk., in bindweed free area of same field								65.7
Red Clov. 1/	4-6 in.	5/25	Dow A-510	1000	3/4	17.0	77.3	100	
Red Clov.	4-6 in.	"	"	"	1 1/2	63.4	99.1	100	
Red Clov.	4-6 in.	"	"	"	2 1/4	89.8	99.8	100	
Corn 1/	12" high	6/22	Dow A-510	1000	3/4	0	75.3	(Possibly weak-	
Corn	" "	"	Dow A-510	"	1 1/2	0	77.2	ened the brace	
Corn	" "	"	Dow A-510	"	2 1/4	0	83.5	roots of corn)	

1/ Stand counts used to determine damage to crop or weeds. Percent of kill on weed determined about 90 days after application of chemical.

General Information

Cooperator: Oliver C. Lee, Purdue, University, Lafayette, Indiana
Name of Weed or Weeds Bindweed & Ragweed Competitive crop: Oats, Red Clover, Corn
Topography (bottomland, upland upland Soil texture (sandy, loam, clay loam
Soil Fertility (high, med., low) HIGH Soil reaction (PH) 7
Soil Mosture (wet, moist, dry) Moist

Weather data at time of application

Humidity (% or other index) 65 Temp 69 degreos F. Cloudiness Clear
Amount Received (ins.) 24.04 Time until first rain 12 hrs.

TABLE 6

OBSERVATIONS ON THE EFFECT OF SEVERAL 2,4-D FORMULATIONS USED AS A HERBICIDE ON THE YIELD OF WHEAT. PERRYTON, TEXAS, 1945

Time of Application			Conc.	Rate	Percent Injury to Different Weeds		
State of Growth	Date	Chemical used	ppm.	gals. Sq. rod	To Crop	Bind-weed	Blue-weed
full growth	5/23/45	Weedone	1-60	3/4 gal.	0	95%	
" "	5/24/45	Weedone	1-60		0	95%	
" "	5/25/45	Weedone	1-60		0	80%	
full growth	6/15/45	Weedone	1-80		0	60%	
" "	6/16/45	Weedone	1-60		0	90%	70%
" "	6/17/45	Weedone	1-60		0	90%	
" "	6/17/45	Dow A-510	1-80		0	95%	0
" "	6/17/45	Dow A-510	1-80		0	70%	0
full growth	8/14/45	DuPont No. 2	1-25		0	75%	
" "	8/14/45	DuPont 10% AM	1-20		0	60%	
full growth	7/20/45	Weedicide (Liquid)	1-16		0	100%	
full growth	9/18/45	Weedinol	1-40		0	85%	50%
full growth	8/28/45	Con. No. 4	1-3		0	50%	

General Information

Cooperator: Hood Wills, Perryton, Texas
Name of weed or weeds, Bindweed Competitive crop, Wheat
Topography (bottomland, upland) UPLAND Soil Texture (sandy, loamy, clay Loam
Soil Fertility (high, med., low) Medium Soil Reaction (PH)
Soil Moisture (wet, moist, dry) DRY

Weather data at time of application

Temperature: 85 °F Cloudiness _____
Humidity (% or other index _____ Time until first rain _____
Amount received (ins.) _____

Table 7

USE OF SEVERAL 2,4-D AND SELECTIVE HERBICIDES TO CONTROL ANNUAL WEEDS IN BUFFALO GRASS AND ITS EFFECT ON CROP YIELD. HAYS EXPERIMENT STATION, HAYS, KANSAS, 1945, F. L. TIMMONS, COOPERATOR

Time of Application Date	Hour	Chemical	Conc. ppm.	Rate Gals. sq. rod	% weeds killed Wild Lettuce	Flea-bane	Yields of buff. grass lbs. seed per acre	% empty burs	Inc. over check	tons hay per acre	Inc. over check
1. Applications made May 4-5, 1945. Buffalo grass just beginning new growth. Wild Lettuce 2-4" tall, fleabane 1-2" tall, both very thick.											
5/4	4:25	Dow A-506	500	3/4	95	0	693		427	2.68	.78
5/4	4:30	Dow A-506	500	1 1/2	99	20	426		160	2.93	1.03
5/4	4:35	Dow A-506	1000	3/4	100	0	636		370	2.68	.78
5/4	4:45	Dow A-506	1000	1 1/2	100	50	433		167	2.68	.78
5/4	4:50	Dow A-506	1500	3/4	100	20	335		69	2.58	.68
5/4	4:55	Dow A-506	1500	1 1/2	99	70	494		228	3.00	1.10
5/4	5:00	2,4-D inc'wax	1000	3/4	100	70	282		16	2.68	.78
5/4	5:00	2,4-D inc'wax	1000	1 1/2	100	90	651		385	2.96	1.06
5/4	5:05	DuPont No.1	1000	3/4	95	0	615		349	2.44	.54
5/4	5:10	DuPont No.1	1000	1 1/2	99	20	678		412	3.06	1.16
5/4	5:15	DuPont No.2	1000	3/4	99	0	463		197	2.79	.89
5/4	5:20	DuPont No.2	1000	1 1/2	100	25	784		518	3.14	1.24
5/4	5:25	DuPont No.3	1000	3/4	100	80	379		113	2.50	.60
5/4	5:30	DuPont No.3	1000	1 1/2	100	90	775		509	2.96	1.06
5/5	10:45	DuPont No.4	1000	3/4	100	95	609		343	2.50	.60
5/5	10:50	DuPont No.4	1000	1 1/2	100	95	670		404	2.79	.89
5/5	10:55	Weedone	1000	3/4	98	20	451		185	2.50	.60
5/5	11:00	Weedone	1000	1 1/2	100	80	578		312	2.82	.92
5/5	11:05	Weedicide	1000	3/4	95	10	505		239	3.17	1.27
5/5	11:10	Weedicide	1000	1-1/2	99	25	671		405	2.50	.60
5/5	11:15	Sinox-A.Sul	10780	1-1/2	90	90	898		632	3.55	1.65
5/5	11:20	Dow G-506	5400	1-1/2	50	20	640		374	2.82	.92
5/5	11:25	Dow A-510	1000	3/4	80	0	580		314	3.35	1.45
5/5	11:30	Dow A-510	1000	1-1/2	90	0	631		365	2.68	.78
		no treatment					266		-	1.90	-
5/10		hand weeded					565		299	2.27	.37
6/11		mowed					378		112	2.33	.43
2. Applications made June 11, 1945. Buffalo grass setting seed. Wild lettuce 8-10" tall, fleabane 4-8" tall.											
6/11		Dow A-506	1000	1-1/2	70	25	150	45	116	3.00	1.10
6/11	3:00	Dow A-506	1500	1-1/2	98	50	211	47	-55	2.61	.71
6/11	3:10	Dow A-506	2000	1-1/2	99	70	195	47	-71	2.75	.85
6/11	3:20	Dow A-510	1000	1-1/2	95	30	177	39	-89	2.47	.57
6/11	3:30	Chipman2,4-D	1000	1-1/2	95	50	122	28	-144	2.37	.47
6/11	4:45	2,4-Din c'wax	1000	1-1/2	100	25	222	35	-44	2.54	.64
6/11	5:00	DuPont No.1	1000	1-1/2	98	10	190	26	-76	2.54	.64
6/11	3:40	DuPont No.2	1000	1-1/2	95	20	360	29	94	2.54	.64
6/11	3:50	DuPont No.3	1000	1-1/2	100	80	340	25	74	2.68	.78
6/11	4:00	DuPont No.4	1000	1-1/2	99	100	270	34	4	1.91	.01
6/11	4:40	Weedone	1000	1-1/2	95	99	328	24	62	2.61	.71
6/11	4:10	Weedicide	1000	1-1/2	80	25	389	46	123	2.47	.57
6/11	4:20	Sinox-A.Sul	10780	1-1/2	50	100	479	23	213	2.96	1.06
6/11	4:30	Dow G-506	5400	1-1/2	25	100	194	14	-72	2.40	.50
		no treatment					266	14	-	1.90	-
6/11		mowed					378	7	112	2.33	.43

Table 8

OBSERVATIONS ON THE EFFECT OF 2,4-D IN CARBOWAX AS A HERBICIDE ON CROP PLANTS AT HAYS EXPERIMENT STATION, HAYS, KANSAS, 1945. F. L. TIMMONS, COOPERATOR. APPLICATIONS MADE ON JULY 12, 1945.....

Stage of Maturity	Crop, grass, shrub, or tree	Percent injury of crop, 7/31/45 2,4-D in Carbowax, diff. conc. of 2,4-D, Gals. per square rod				Form of Crop Harvested	Yield, Percent of untreated check 2,4-D in Carbowax, diff. conc. of 2,4-D, Gals. per Sq. Rod			
		500 ppm.	1000 ppm.	2000 ppm.	1500 ppm.		500 ppm.	1000 ppm.	1500 ppm.	2000 ppm.
7/12/45										
Seedling	Alfalfa	100	100	100	100					
"	Sweet Clover	95	100	100	100					
Bearing	String Beans	70	95	100	99					
"	Peas	95	100	100	100					
Large	Carrots	90	100	100	100					
Seedling	Lettuce	100	100	100	100					
Large	Onions	60	100	100	100					
Seedling	Spinach	100	100	100	100					
Bloom	Tomatoes	100	100	100	100					
Forming runners	Buffalo grass	20	50	70	60	Forage	38	27	67	65
18" tall	Corn	30	40	40	40	Grain	0	0	68	83
8" tall	Kafir	20	40	40	40	Forage	49	60	47	60
						grain	0	0	0	0
6" tall	Millet	50	60	70	60	Forage	79	84	68	79
10" tall	Sudan Grass	0	30	30	30	Forage	84	84	61	90

General Information

Cooperator--F. L Timmons
Topography (Bottomland, upland) Level upland
Soil fertility (high, med., low) High
Annual Rainfall (ins.) 22.76 (Ave.)Lower this year

Address--Hays Exp. Sta., Hays, Kansas
Soil texture (sandy, Loam, Clay) Silty clay loam
Soil reaction (PH) Alkaline, about 7.5

Table 9

THE EFFECT OF SEVERAL 2,4-D FORMULATIONS AND SELECTIVE HERBICIDES, USED IN THE CONTROL OF HOARY CRESS, ON THE YIELD OF WHEAT, HAYS, KANSAS, 1945, F. L. TIMMONS. COOPERATOR

Plot No.	Chemical	Treatment Data: Concentration ppm.	Treatment Data: Rate gals. per sq. rd.	Treatment Data: Date	Treatment Data: Temp of	Treatment Data: Humidity %	Result Data: % kill of Hoary Cress (1) 5/25 (injury)	9/18	10/19	Result Data: Yield of Wheat Bus. per A.	% of check
27	Dow A-506	1000	3/4	5/5	72	50	20	50	--	---	---
31	"	"	1 1/2	"	"	"	30	68	36	8.8	83
32	"	"	2 1/4	"	"	"	50	86	65	6.9	65
33	"	1500	3/4	"	"	"	40	54	0	11.3	107
34	"	"	1 1/2	"	"	"	50	81	68	12.6	119
35	"	"	2 1/4	"	"	"	60	86	73	13.2	125
36	2,4-D in Carbowax	1000	1 1/2	"	"	"	50	74	57	12.6	119
44	DuPont IN-6065	"	"	5/10	50	65	50	88	72	10.9	103
38	" IN-4311-A9	"	"	5/5	72	50	50	76	16	10.1	95
39	" IN-6065-A7	"	"	"	"	"	70	91	80	10.7	101
40	" IN-6065-A9	"	"	"	"	"	90	87	82	4.4	42
41	Weedone	"	"	"	"	"	70	95	78	5.7	54
42	Weedicide	"	"	"	"	"	50	84	69	5.0	47
43	Dow A-510	"	"	"	"	"	50	80	72	5.0	47
12	Dow A-506	2000 (2)	1 1/2	5/5	"	"	70	96	55	6.4	52
13	2,4-D in Carbowax	"	"	"	"	"	80	99	90	11.2	84
16	DuPont IN-6065	"	"	"	"	"	50	99	53	6.1	51
17	DuPont IN-4311-A9	"	"	"	"	"	50	93	65	7.5	50
19	DuPont IN-6065-A7	"	"	5/10	50	65	10	99	85	5.8	48
20	DuPont IN-6065-A9	"	"	"	"	"	99	66	18	2.0	17
21	Weedone	"	"	5/5	72	50	80	98	76	11.3	64
23	Weedicide	"	"	5/10	50	65	50	87	30	8.3	69
24	Dow A-510	"	"	5/5	72	50	40	82	12	8.7	52
37	DuPont IN-6065	3000	"	"	"	"	80	94	77	13.5	127

(1) Percent kill determined from counts of surviving plants as compared with the original stand of hoary cress
(2) The plots treated with a 2000 ppm. concentration of the different chemicals were located on a different patch of hoary cress on higher land than the plots treated with lower concentrations and are, therefore, not absolutely comparable with the latter.

TABLE 10

OBSERVATIONS ON EFFECT OF 2,4-D TREATMENTS ON CROP AND ORNAMENTAL PLANTS AT THE UNIVERSITY OF NEBRASKA SUB-STATION, NORTH PLATTE, NEBRASKA, 1945, GLENN VIEHMEYER, COOPERATOR

Specie	Date	Chemical	PPM	% Kill	Remarks
Juniperus virginiana L. Red Cedar	6/21	Dow A510	1000	0	The tree was completely drenched with the solution. At time of application it was rapid with 6-10 in. of new growth. For about 3 weeks, the foliage was slightly chlorotic and a very slight distortion of the new growth appeared. By mid August, complete recovery was evident and the tree had made approximately as much growth as untreated trees nearby. Height of tree, 2-ft., age four years.
Picea albertiana Rehd. Black Hills Spruce	6/21	Dow A510	1000	0	2 trees treated, age 4 yrs. height 18 in. Drenched with the solution. No effect of the herbicide noted at any time during the growing season.
Pinus edulis, Engelm. Pinion Pine	6/21	Dow A510	1000	?	1 tree treated, age 4 yrs. ht., 12 in., rapidly growing shoots 6 in. All growth arrested. Needles failed to develop. 90% of growth dead by Sept. 1. Tree apparently recovering.
Pinus mughus Mugo Pine	6/21	Dow A510	1000	0	1 tree treated, age 5 yrs., Dia. 24 in. Drenched with solution. Slight twisting of new needles. No permanent injury.
Common lilac	6/21	Dow A510	1000	0	84 stems of new sprouts treated all in a single clump. The only apparent damage was a twisting of the stems and a slight checking of growth. Apparently fully recovered by Fall.
Rosa Sp. Wild Rose	6/21	Dow A510	1000	0	New growth twisted tips of branches killed back 2,4 in. App. fully recovered
Fragaria americana Britt Wild strawberry	6/21	Dow A510	1000	None	Some leaf damage quickly recovered.
Strawberry Gen	6/21	Carbowax	1000	None	Some leaf damage quickly recovering.
Rhubarb	6/21	"	"	"	All foliage killed back. Primary buds all killed, much damage to upper roots. A few weak secondary buds developing Oct.12 will probably not survive.
Asparagus, Paradise	6/21	Dow A510	1500	None	Rapidly growing young shoots. Very light chlorotic effect for a few days. Recovery rapid and complete.
Hollyhock	6/21	Carbowax	1000	100	Full bloom
"	6/17	Chipman	1000	100	Full bloom
"	5/1	Weedone	1000	100	Rosette, 2nd yr.
"	7/2	Dow A510	500	100	Rosette 1st yr.

Table 10, Continued

Specie	Date	Chemical	PPM	% Kill	Remarks
Iris germanica	6/21	Dow A510	1000	99	Full bloom and full sun.
Tall bearded iris	6/16	DuPontll	1000	5	Past bloom, partial shade
Iris sp. Intermediate bearded iris.					
Symphoricarpos occidentalis. Hook.	6/21	Dow A510	1000	?	Killed to ground
Sambucus canadensis L.	6/21	Dow A510	1000	?	Killed to ground. Few weak sprouts Oct. 1, much damage to underground parts, some recovery probable.
Ampelopis quinquefolia var. Engelmannii	7/7	Chipman	1000	?	1 plant apparently completely dead.
Prunus americana Marsh. wild plum	6/21	Dow A510	1000	?	Defoliated no recovery, wood apparently alive.
Prunus besseyii Bailey Sand cherry	6/21	Dow A510	1000	?	90% of top killed.
Ribes aureum Pursh Golden currant	6/21	"	"	?	Much damage, recovery questionable
Chrysothamus sp.	6/21	Dow A510	1000	100	rabbitbush species unknown
Artemesia sp.	6/21	"	"	99	Unidentified Sagebrush
Acer glabrum Torr. Dwarf maple	6/21	"	"	---	1/4 of top killed back
Euonymus atropurpureum Jacq. Wahoo	6/21	"	"	None	Killed to ground, recovered
Populus Sp. Cottonwood	6/21	"	"	100	Sprouts apparently completely killed
Ulmus americana L. Chinese elm	7/8	"	1000	100	Seedlings killed by all chemicals at all concentrations.
Chinese elm	6/16	Dow A510	1000	?	8 ft. trees, branches killed back 2-5 feet.
Ulmus americana L. American elm	7/18	Chipman	1000	None	5 ft. seedlings very slight distortion.
Celtis occidentalis L.	6/17	Chipman	1000	?	1 ft. seedling, defoliated badly damaged.
Hackberry	7/8	Chipman	1000	None	5-6 ft. seedlings, slight distortion.
Spiraea vanhouttei	6/21	Dow A510	1000	"	Tips of branches killed back 6 in.
Clematis ligustfolia Nutt. Virgin's bower	"	Chipman	1000	"	No effect apparent
Rhus glabra L. Sumach	7/8	"	"	"	Summer dormant, soil dry

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EXPERIMENT 1V, LAWN WEEDS, Dr. C. J. WILLARD, OHIO STATE UNIVERSITY

This group, as a whole is more definitely interested in field weeds than lawn weeds. However, data or observations on the use of 2,4-D on lawn weeds were received from the following persons:

V. F. Bruns, Bindweed Experimental Project, Canton, Kansas
K. P. Buckholtz, Dept. of Agronomy, University of Wisconsin, Madison, Wisconsin
E. L. Erickson, Dept. of Agronomy, S. D. State College, Brookings, South Dakota
R. F. Fulleman, Dept. of Agronomy, University of Illinois, Urbana, Illinois
N. S. Hanson, Dept. of Agronomy, University of Nebraska, Lincoln, Nebraska
R. B. Harvey, University of Minnesota, St. Paul, Minn. (Deceased, data sent by F. R. Immer.)
E. S. Hopkins, Department of Agriculture, Ottawa, Ontario
R. A Hyre, Ohio State University Research Foundation, Columbus 10, Ohio
O. C. Lee, Dept. of Botany, Purdue University, Lafayette, Ind.
T. K Pavlychenko, University of Saskatchewan, Saskatoon, Saskatchewan.
C. R. Bunyan, Supt., Cemetery of Spring Grove,Station, W., Cincinnati, Ohio
L. M Stahler, Lamberton Experiment Station, Lamberton, Minnesota
F. L. Timmons, Hays Experiment Station, Hays, Kansas
Glenn Viehmeyer, Horticulturist, University of Nebraska Substation, North Platte, Nebraska
C. J. Willard, Dept. of Agronomy, The Ohio State University, Columbus 10, Ohio
H. E. Wood, Department of Agriculture, Winnipeg, Manitoba
J. W. Zahnley, Department of Agronomy, Kansas State College, Manhattan, Kansas

"Lawn Weeds" is almost synonymous with dandelions to many of us, and far more reports of effects of treatments on dandelions were received than for any other weed. Fortunately, a high proportion of other broad-leaved lawn weeds react similarly to dandelions.

In going over the reports, the results of the tests from Kansas and Nebraska seemed to be generally less favorable than those from other parts of the country and they were averaged separately. Two summary tables are presented: one, tabulating the effects of different materials at a standard rate, the other the effects of varying the rate of application of one material.

A very extensive series of trials of different materials on dandelions and broad-leaved plantain by H. E. Wood, Manitoba, could not be included in these averages because the rate of application was 3/4 of an Imperial gallon per square rod throughout. The materials Wood tested were 2,4-D from Standard Agr. Chemicals, Inc., Nagatuck A-6-B Weedanol, DuPont No. 1, DuPont No. 2, Chipman 2,4-D, Dow A-506, and 2,4-D in carbowax. Despite the lower rate, the results were at least equal to the averages in the table, with no important differences between materials. Lee, Stahler and Timmons also ran series of different products at 3/4 gallon per square rod, which did not change the picture significantly, and so are not reported. Many other incomplete sets of data have been omitted from tabular summaries, although they have contributed to the final picture.

So few sets of data were available for weeds, other than dandelion, that for other lawn weeds, only a classification of the weeds by degree of injury is presented. The relation between the different rates and materials would not be significantly changed if the limited additional data were averaged with the dandelion data. However, on certain resistant weeds, notably knotweed, there were greater contrasts between the materials than when used on dandelion. Viehmeyer, eg., obtained a kill of 20-25% on knotweed from the sodium salt, 1000 ppm at 1½ gallons per square rod, and 98 percent kill from carbowax at that rate. The corresponding readings for dandelion were 95 percent and 100 percent. The salts are definitely less active than the acid in a carbowax or oil base, or the esters.

The same principle that there are greater contrasts between materials with hard-to-kill plants or under difficult conditions, is shown in the greater contrasts between materials in the results on dandelions in Kansas and Nebraska than in the rest of the area.

In some instances, the final effects on dandelions may not be known until next year. On most other lawn weeds the effect could be estimated satisfactorily this year.

The different investigators did not allow the same interval after treatment before estimating the percent of kill. The highest apparent kills were obtained about a month after treatment, and after that, if later readings were reported, they always showed a lower percent of kill, due to seedlings, resprouting, or both. (There definitely was resprouting of old roots in several experiments.)

Concentration of 2,4-D Sprays to Use on Lawn Weeds:

There is nothing to suggest an advantage in using more than 1000 ppm for dandelions under favorable conditions; indeed a high proportion of satisfactory kills was obtained at 500 ppm. But unfavorable conditions, as in summer, or the average of the Kansas and Nebraska data, 500 ppm is entirely unsatisfactory, and 1500 ppm are required for satisfactory kills, with still better kills at 2000 ppm in some instances. Considering that lawn weeds are generally a mixed population, and that what constitutes "favorable" conditions is not yet definitely known, it would not seem desirable on bluegrass lawns to recommend less than 1000 ppm and 1500 ppm would be preferable for summer use, or where more resistant weeds are included in the stand.

Amount of Spray to Use on Lawn Weeds: The difference between 3/4 gallons and 1 1/2 gallons per square rod are not great, except for Kansas and Nebraska. In the other states such differences as appear might be (definitely were, in Ohio) due to poor coverage at the lighter rate. In the Kansas-Nebraska data, it may be that the 3/4 gallon applications did not put on enough 2,4-D for a satisfactory kill, under the conditions of the test. Since, in practice, it is very difficult to measure areas to be treated, it seems that it is much more important to determine the most effective concentration to use than the rate per square rod or other area. If it is feasible merely to recommend that a solution of a certain strength be applied until the leaves are thoroughly wet, an important step in simplifying directions is taken. These data suggest that such directions for lawn treatment are entirely possible.

Date of Applying 2,4-D to Lawn Weeds: Many reports mention cool weather as unfavorable to kills on dandelions, reporting higher kills late in the spring than early in the spring. On the other hand Viehmeyer says, "It also seems that slower kills are better than those which kill the tops at once. Slow top kill is apparently correlated with rather low temperature." Willard obtained more complete kills of roots from treatments on April 28, which were followed by over a week of temperatures 10 degrees below normal, with killing frost on May 1, than from June treatments.

Summer treatments were often less effective than spring. It seems possible that a large proportion of these seasonal differences in effectiveness on dandelions derive from the basic principle that 2,4-D is most effective when applied on plants which are growing actively. An observation of Hyre at Columbus, Ohio is pertinent here. After three weeks of dry weather, he laid out 3 strips of bluegrass lawn, one of which was heavily watered and fertilized. A week later all three strips were treated with S.W. 1 at 1000, 1500 and 2000 ppm. Another strip was watered and fertilized the day before treating with 2,4-D and the third strip one week after treating. There was almost no regrowth of dandelions on the strip watered and fertilized a week before treatment, but considerable regrowth on the other two areas. Plantains, however, were killed in all three strips.

Fall treatments, so far as it has been possible to evaluate them have been very satisfactory. Since early fall treatments do not permit reinvasion of the vacated areas by crabgrass, and yet give bluegrass a long period to spread and fill in these spots, it may be that the most favorable time to treat a neglected bluegrass lawn is early fall, especially if followed by fertilization of the bluegrass, and, if there are large totally bare spots reseeding.

However, the psychological time to treat will always be when the dandelions start blooming in the spring. Fortunately this time is satisfactory for the killing of the dandelions, although it may result in more crabgrass than would otherwise have been able to establish itself.

Lawn Grass injury has been greatest in midsummer, according to some reports which is another reason for spring and fall treatments.

Injury to Lawn Plants: Bluegrass was not injured by 1000 ppm. In some instances, higher concentration caused a temporary yellowing and slowing of growth. Stahler reported some killing of bluegrass at 2000 ppm. Viehmeyer reported that spraying one percent solution of iron sulphate (ferrous sulphate, copperas) with the 2,4-D, prevented entirely the injury to the bluegrass without reducing the kill of dandelions.

Timmons found considerable injury to buffalo-grass from 2,4-D at Hays, and buffalo-grass and blue gramma were generally reported more sensitive than bluegrass. Viehmeyer reported no injury whatever to smooth bromegrass.

Bent grass was not mentioned in these reports, except by Wood, who reported "encouraging results" in taking white clover out of bent with 2,4-D.

White clover was generally severely injured but was not reported entirely killed by 1 1/4 gallons at 1000 ppm. Injury to white clover was much greater before July 1 than in summer and fall. Stahler reports that 1 1/2 gallons at 2000 ppm of the sodium salt resulted in nearly complete kills of white clover at all seasons.

Retreatments: Timmons made the only report of retreating lawn weeds. His second application was made in the summer and had "practically no effect".

This does not mean that retreatments of lawn areas will not be required. There is abundant evidence that they will. The meagre evidence available suggests that they will need to be made on the same basis as original treatments.

Sinox, G-506, and Other Di-Nitro Formulations: Several cooperators included tests of Sinox with the tests of 2,4-D materials. As was to be expected, itwwas of almost no value in eradicating dandelions. G-506 was also rather ineffective on dandelion. Fullman's data being an outstanding exception. The di-nitro compounds have some promise for use on crabgrass, nimblewill, and other weedy grass in lawns, but that is beyond the scope of this report.

Summary and Conclusions: 1. The various formulations of 2,4-D are the most effective, satisfactory herbicides yet offered for the treatment of broad-leaved lawn weeds. One hundred percent success is not to be expected from every application, but it will produce a worthwhile reduction in the amount of broad-leaved weeds in any bluegrass lawn.

2 It is not possible at present to recommend one formulattion of 2,4-D over another. The salts are slower in action, more affected by rain immediately after application and, under some conditions of application, less effective than many carbowax, ester, and oil formulations. On the other hand, the salts are generally simple to handle, and effective where properly used. Slow action may prove to mean greater translocation. It seems likely that there will be place for several types of material when further research has brought out their characteristics more sharply.

3. Formulations of 2,4-D should be used on lawns at 1000 to 1500 ppm, the lower rate for dandelions and weeds of similar resistance spring and fall, the higher rate in summer or when more resistant weeds are in the lawn.

4. The amount of solution applied should be enough to wet the plants well. The exact amount is not vital, if enough is applied.

5. The best times of year to apply 2,4-D on lawn weeds seem to be spring and fall, but it is effective enough at all growing seasons to that one cooperator's rule, "I applied it when I had it, and the time." is not too bad. Much more research on effect of weather and season is needed before clear-cut safe, rules concerning their effects can be stated.

6. Some resprouting, making retreatments necessary, is to be expected in many, probably a majority, of cases.

7. Bluegrass has been uninjured or only temporarily yellowed and stunted by 2,4-D at 1000 or 1500 ppm. There has been some killing on 2000 ppm and higher concentrations.

8. Buffalo grass has been definitely more sensitive to 2,4-D than bluegrass, but it has not been killed out at the rates used.

2,4-D IN DUST FORM, DR. WILLARD

One does not have to do much spraying to learn that water is heavy. When one stops to think of it, it is a bit absurd to go through the effort involved in putting 8 to 16 pounds of water on each square rod, in order to distribute 1/5 to 1/2 ounce of active material on that area. If water is needed, nature provides it nearly perfectly distributed most summer mornings over a considerable share of N.C.S.W.C.C. territory. Furthermore, the owner or operator of a medium sized farm simply does not

have spray machinery, and he doesn't wish to buy it just for weed control purposes.

We, in Ohio, found that out fifteen years ago, when chlorate was introduced -- there was much interest, but little practical farm use of chlorate, as long as we had to apply it as spray. The Ohio station suggested and helped to develop the chlorate-limestone mixture, so that chlorate could be applied dry without breaking up the 100 or 112-pound pellets in which chlorate was delivered at that time.

Then Ohio farmers began to use some chlorate, and the chlorate-limestone mixture had considerable popularity until it was replaced by the modern free-flowing granular chlorate. It is probably that there are likewise many areas where 2,4-D could and should be used but where it will not be, for a long time if we insist that it must be used in water.

A home-made dust was made up with A-506. It worked well enough so that we asked W. C. Dutton of the Dow Chemical Company, to put us up a real dust for trial, and we shortly received samples of G-516, G-518 and G-520, containing respectively 3 1/2, 5 1/4, and 7 percent of the sodium salt of 2,4-D. As dusts, these materials were excellent--they distributed evenly and well.

The dusts were first used on Canada thistles. This weed proved to be highly resistant to 2,4-D in any form, but the dust killed the tops of the plants, just as the spray did.

It is difficult to apply a definite amount of dust to a measured area as is desirable for experimental work, because of the difficulty of completely emptying ordinary commercial dusters. However, some such measured areas were treated by using a small hand duster. One square rod of Canada thistles received A-520 dust equal in 2,4-D content to 3 gallons A-506 at 1500 ppm. Despite the fact that the plants were dry when the dust was applied and that there was no conspicuous dew until after considerable rain had fallen, this one area was as severely affected as any sprayed area, on which rates up to 1 1/2 gallons per square rod at 2000 ppm were used. Notes at the time read "Dust did not adhere well."

On June 22, a clear, warm morning, with heavy dew, poison ivy was dusted with G-520 and G-516 at rates equal to 1 1/2 gallons per square rod at 1500 ppm. Both dusts were more effective than any spray application on poison ivy on this date, the G-520 giving a nearly complete kill. On the same day, but after the dew was nearly off, areas of both field and hedge bindweed were dusted at the same rate, resulting in a 100 percent kill.

The two areas of 9-square rods each, covered with heavy dew, were dusted with a large hand duster on June 28, G-516 on one, G-520 on the other. These areas were of mixed weeds, completely overgrown by field bindweed just coming into bloom. Approximately the same amount of each dust was put on rates equal to 1 1/2 gallons per square rod at about 1650 ppm for G-520 and half as much for G-516. The bindweed was at least 97 percent killed, with very little regrowth later in the summer.

The same day, a poison ivy clump was heavily dusted with G-516, killing it -- the only complete kill of poison ivy we obtained from applications as late in the summer as this. Several other bulk dust applications to various weeds were made through the summer and fall, with good results as far as they could be determined.

These results are preliminary, only, but are definitely encouraging. The only published results with dust that the writer has seen are those in Timely Turf Topics for July, 1945. The tests reported there were exploratory, and sufficiently encouraging so that new tests were in progress at the time.

Timmons, in his lawn weed experiments reported an application of G-520 equivalent to 1 1/2 gallons per square rod at 2000 ppm to buffalo grass lawn on June 26, which resulted in more grass injury, and a higher dandelion kill that the sodium salt in any spray form, but the sprays were applied at half that rate. Dr. Larson wrote that Dr. Stahler had used some 2,4-D dust from Dow but at present, the writer has not seen the results.

The writer's conclusions and suggestions may be summarized as follows:

1. 2,4-D applied in dust on dew-covered plants was most effective as the same amount of the same material applied as spray.

2. Good results were had with all three strengths of dust tried. The most favorable strength to use must be determined by more extensive tests. In favor of a dilute dust;

a. The amateur user of dust will want to put it on until it shows. A dilute dust will give this coverage with less waste of the active ingredient, and less injury to plants which it is not desired to injure.

b. Because it can be seen better it can be more uniformly distributed by hand dusters, where apparent coverage is the criterion of sufficient dosage.

c. It can be sold at a lower price per pound of dust. In favor of a less dilute dust.

d. Less material to ship, carry to the field, and distribute.

e. Less expense for diluents and packaging, so overall cost per unit of 2,4-D is less.

f. With dusting equipment set to put on a uniform amount, rather than judging by appearance, a concentrated dust can be as accurately applied as a weak dust.

In short, if dusting 2,4-D becomes important, there is probably place for both types -- a dilute dust for the small, occasional user, and concentrated dust for the large, professional user.

3. Whether dust can be effectively used in the absence of dew is as yet undetermined. The writer appeals for a study not only of dusts, but of methods of application in general. He does not believe that we need to be tied to distributing such relatively enormous quantities of water as we now do to get a little 2,4-D applied. Aerosols and dust plus a little water, as is now being tried in orchard work, are among the obvious other possibilities.

4. There are several situations where the present dusts and equipment might prove practical:

a. It is particularly a method for the farmer treating his own weeds on areas too large to spray, because of labor and equipment shortages.

b. Fence rows and roadsides containing weeds susceptible to 2,4-D are more readily treated with dust than spray. Highway departments might well consider using dusts. Dusting from 12 midnight to 8 A.M. might make possible a full day of dusting, if dew proves to be essential.

c. Community programs to clean up poison ivy may find dust easier to distribute and use than spray. Poison ivy grows in so many places that are hard to get to with spray tanks!

d. Treating perennial weeds in corn fields after the corn is laid by is entirely feasible with dust, difficult with spray.

e. Pasture weeds, especially in hilly areas, are much more readily treated with dust than spray. This includes the treatment of Canada thistle in pastures. While no treatment of Canada thistle with 2,4-D has so far prevented resprouting, retreatments must ultimately destroy it by starvation, and no practical means of killing Canada thistle in unplowable pastures has previously been devised. Chlorate leaves the ground bare and subject to erosion. 2,4-D leaves the grass intact, and several retreatments with dust would be less expensive in labor than one with spray.

f. Whether dust has a place in lawn work is a question. A good hand duster costs only a fraction of what a good hand spray does, and the labor saved is important, but the hazard of the dust being carried to susceptible ornamentals and vegetables is very great.

(Tables on the following pages complete this Report.)

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1945

PERCENTAGE OF DANDELIONS KILLED, N.C.S.W.C.C. COOPERATIVE EXPERIMENTS

Investigator and Location	Date Applied	Materials applied at 1 1/2 gallons per square rod, 1000 ppm.													
		Carbowax	A-506	A-510	Dupont No. 1	Dupont No. 2	Dupont No. 3	Dupont No. 4	Weed-one	S.W.1	Acme 1	Weed-a-nol Chipman	Weed-icide	G-506	
Northern and Eastern States															
R. F. Fullerman, Urbana, Ill.	June 11	86	94	96	83	91	88		92			95	98		
R. F. Fullerman, Urbana, Ill.	June 28	96		95				94							84
R. F. Fullerman, Urbana, Ill.	Aug. 8			97						94		92			
C. C. Lee, Lafayette, Ind.	May 28	97		96	88	95	96	96	100				97		4
L. M. Stahler, Lamberton, Minn.	May 8	99	99		94	99	94	28	99						5 5
L. M. Stahler, Lamberton, Minn.	July 5	99	99	99	99	99	88	36	99						
L. M. Stahler, Lamberton, Minn.	Sept. 3	99		99	99	99	99	40	99	99	99	99			
C. J. Willard, Columbus, Ohio	Apr. 28		90		75	83			80						
C. J. Willard, Columbus, Ohio	June 19	70	73		78	75			80	68					
R. A. Hyre, Columbus, Ohio	June 6	95	75	75						99					
E. S. Hopkins, Ottawa, Ont.	June 19	100		100	100	100	100	50	100						
Average adjusted to Carbowax		93	92	93	90	93	91	54	94	98	93	96	64		46
Kansas and Nebraska															
V. F. Bruns, Canton, Kansas	Apr. 13	86	39						99				89		
F. L. Timmons, Hays, Kansas	May 4	80	70	50	30	40	95	95	80				60		0
F. L. Timmons, Hays Kansas	June 19	73							85						
F. L. Timmons, Hays, Kansas	June 25	64		60		6	88	5	93			95	39		5
N. S. Hanson, Lincoln, Neb.	Apr. 21	60			85	93			75				45		
N. S. Hanson, Lincoln, Neb.	July 11	100		100	98	76			79			84	95		
N. S. Hanson, Lincoln, Neb.	Aug. 30	89		75	82	15			82			38	78		
Glenn Viehmeyer, N. Platte, Neb.	May 1	98	35		63	73			95				53		
Glenn Viehmeyer, N. Platte, Neb.	June 14	100	95	80	20	64			100			100	96		
Glenn Viehmeyer, N. Platte, Neb.	Aug. 4	90	85	85	51	70			95						
Average adjusted to Carbowax		84	60	70	48	54	100	58	88			75	69		3

Estimated significant difference at least 15% --more where few figures are involved in the average.

PERCENTAGE OF DANDELIONS KILLED, N.C.S.W.C.C. COOPERATIVE EXPERIMENTS, 1945

Investigator and Location	date applied	Conc. and gallons applied per square rod: 500 ppm 3/4 gal	500 ppm 1½ gal	1000 ppm 3/4 gal	1000 ppm 1½ gal	1500 ppm 3/4 gal	1500 ppm 1½ gal	2000 ppm 1 1/2 gal	Material used
Northern and Eastern Stations									
O. C. Lee, Lafayette, Ind.	May 28	88	87	92	89	93	93		A-510
O. C. Lee, Lafayette, Ind.	June 29	96	98	98	100	97	100		A-510
O. C. Lee, Lafayette, Ind.	Aug. 22			99	100	100	100		A-510
L. M. Stahler, Lamberton, Minn.	May 8	70	82	95	99	99	99		A-506
L. M. Stahler, Lamberton, Minn.	July 5	85	99	99	99	99	99	99	A-506
L. M. Stahler, Lamberton, Minn.	Sept. 3	92	99	99	99	99	99	99	A-510
C. J. Willard, Columbus, Ohio	Apr. 28	52		70	90	72	90	97	A-506
C. J. Willard, Columbus, Ohio	June 19		78		73		80	80	A-506
R. A. Hyre, Columbus, Ohio	May 14				45			60	A-510
R. A. Hyre, Columbus, Ohio	May 14		90		97			99	S.W. 1
R. A. Hyre, Columbus, Ohio	June 6		80		75			75	A-506
R. A. Hyre, Columbus, Ohio	June 6		78		75			87	A-510
R. A. Hyre, Columbus, Ohio	June 6		98		99			100	S.W. 1
E. S. Hopkins, Ottawa, Ontario	June 19				100	100	100		A-510
K. P. Buckholtz, Madison, Wis.	June 8	0	0	0	20			40	A-506
Average adjusted to 1000 ppm 1½ gal.		67	80	79	84	82	85	91	
Kansas and Nebraska									
V. F. Bruns, Canton, Kans.	Apr. 15	3	16	14	39	12	51		A-506
F. L. Timmons, Hays, Kans.	May 4	10	20	40	70	30	90		A-506
F. L. Timmons, Hays, Kans.	June 25		41		48		60		A-506
J. W. Zahnley, Manhattan, Kans.	Apr. 18		18	25	24	25	60		A-506
N. S. Hanson, Lincoln, Neb.	Apr. 21	3	5	8	0	13	35		A-510
N. S. Hanson, Lincoln, Neb.	July 11	90	58	74	99	88	96		A-510
Glenn Viehmeyer, N. Platte, Neb.	Apr. 26	11	14	18	35	38	90		A-506
Glenn Viehmeyer, N. Platte, Neb.	June 14		25		95		100	100	A-506
Glenn Viehmeyer, N. Platte, Neb.	June 16		30	10	80	25	99	100	A-510
Glenn Viehmeyer, N. Platte, Neb.	Aug. 4				51		55	90	Dup. 1
Glenn Viehmeyer, N. Platte, Neb.	Aug. 4				70		70	95	Dup. 2
Average adjusted to 1000 ppm at 1 1/2 gal.		27	26	30	56	40	75	72	

EXPERIMENT IV N.C.S.W.C.C. COOPERATIVE EXPERIMENTS
LAWN WEEDS

Most members of the group reported on other lawn weeds besides dandelions. Although the reports did not always agree, as to the difficulty of killing certain weeds, as a whole the weeds could be classified as follows:

I. At least as readily killed as dandelions.
Buckhorn plantain (Plantago lanceolata)
Common chickweed (Alsine media)
Mouse-ear chickweed (Cerastium vulgatum)
Field bindweed (Convolvulus arvensis)
Shepherd's purse (Bursa bursa-pastoria)
Henbit (Lamium amplexicaule)
Yellow trofoil (Medicago lupulina)
Sweet clovers (Melilotus officinalis and alba)
Western perennial ragweed (Ambrosia coronopifolia)
Kochia (Kochia scoparia)
Ground Ivy (Glecoma hederacea)
Thyme-leaved speedwell (Veronica serpyllifolia)

II. Generally killed but less readily than dandelions.
Knotweed (Polygonum aviculare)
Common plantain (Plantage major and rugelli)
Lettuce (Lactuca sp.)
Spotted spurge (Chasmesyce maculata)

III. Sometimes killed, but frequently or generally not killed.
Red or sheep sorrel (Rumex acetosella)
Curled dock (Rumex crispus)
Wood sorrel (Oxalis sp.)

IV. Reported not killed and no report of their being killed.
Crabgrass (Syntherisma sanguinale and ischaemum)
Violet (Viola sp.)
Yarrow (Achillea millefolium)
Nimblewill (Muhlenbergia schreberi)
Yellow foxtail (Chaetochloa glauca)
Quack grass (Agropyron repens)

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Dr. W. W. Worzella took over as Chairman in place of Mr. F. L. Timmons.

DR. WORZELLA: From now on, we will hear from other sections of the United States and also Canada. Our first speaker is Mr. W. S. Ball, Secretary of the Western States Weed Conference. Mr. Ball will give us the results of the experiments in Western States.

REPORT ON 2,4-D EXPERIMENTS IN THE WESTERN STATES
W.S. Ball, Western Weed Conference Sec.

Mr. Chairman, ladies and gentlemen. Inasmuch as the research men of the North Central States have given you a very detailed report of 2,4-D, I think it would be a matter of repetition if I would give the reports of our research men in the Western Conference. These man have carried on, I believe, a very similar program, and according to the reports the results have been much the same. I am going to deviate a little, giving you some of the reports of the various men very hurriedly, and go into more or less the practical application of 2,4-D as I have observed it in California.

I am personally not a research man, so I have been in the field from the practical angle, more tham from the research angle.

From Oregon we have a report that the control of weeds and turf on the various types has been good, with the exception that in some cases it has brought about injury to grasses and it has been necessary to lower their concentrations in order to get favorable results.

Morning glory has been good, while Canada thistle confirms the information that you have already had that it takes greater concentration and the results are not as good as that of Morning glory. On poison hemlock and water hemlock, 2,4-D seems to

be very effective, and something that is going to help us a great deal in the Western States.

The black berry and poison oak, as we have it, has not yielded very successfully according to Oregon reports, and this is quite general throughout the Western States.

The results of the experiments vary from 20 to 100 percent. In other words, they seem to feel there is a great deal of work yet to be done before we are in a position to give a general or blanket recommendation for weed control.

Idaho reports very varied results and in most cases they are very disappointing. I was amused at getting this because we had our Western Weed Control Conference in Boise last year and we had one-half a day that we spent on a field tour. On this tour we observed a number of these plots, and as the boys this morning reported, they were surface readings, and it looked pretty good at that time. Upon getting the report from our representative in Idaho, reporting for the various district men throughout the states, the general report is that they are disappointed. Very little detail was given.

The reports, generally, are very similar to those given this morning and for that reason I will not go into a great deal of detail. A few points were brought out relative to the different forms of 2,4-D, and these were set up with ester formulations as most effective and ammonium salts next. 2,4-D dissolved in other water or organic solvents is next effective and less effective is the sodium salt.

We have carried on quite a little work in California, I believe, and our boys have done the most extensive work, inasmuch as we have conditions there more favorable in many cases and inasmuch as California seems to grow every type of weed that grows. We have a great field to work on.

I am going to quote a short paragraph from the Expperiment Station, prepared by Mr. Harvey. "The perennial weeds tested morning glory as apparently one of the easiest to kill, and this has been quite apparent as far as California is concerned. Hoary cress is somewhat more difficult and may require larger amounts of chemical per acre." In our hoary cress plots, which I have checked, we seem to have set up a temporary dormant condition as far as the roots are concerned, in that we have symptoms of injury, but they are not breaking down as they do in morning glory and other more susceptible weed plants.

"Russian knapweed is difficult to wet, and it may be necessary to use larger quantities of the spray or additional wetting agent in order to get a coverage which we will have to get before we can consider 2,4-D really effective on this particular weed."

We have found that in our water weed problem, 2,4-D is a very promising herbicide. We have gotten some of the best results as far as our water weeds are concerned than anything we have ever tried. We have tried all of the other materials that we have had and we had very poor results. Our water weed problem has been one of mechanical control and until 2,4-D was introduced, we have had nothing in the chemical line that was at all effective.

There is one other point I want to bring out relative to 2,4-D and that is the effect of 2,4-D on soil. In California we have had an awful lot of this material put out under all conditions. The fact that it was so highly publicized put it into the hands of many people who knew nothing about the material and the last three or four months I have had the job of trouble shooting up and down the state, trying to tell someone why it did this or why it didn't do something else. In most cases we killed the crop plant but the weeds kept on growing and so it has been a little discouraging in a way, to tell them when and when not to use it.

I would like to take a few minutes to give you some of the results of 2,4-D in our field applications. I think this morning you have had some very good reports of what it can and will do. When you get around to 90 and 95 percent killing average, you are doing pretty well. We have had some rather disastrous results in the use of 2,4-D and I will try to give you some of those situations as they occurred.

We have oneparticulary where we had dogbane. The commercial men in this particular case, I thought, were very careful in that they suggested he use only a small amount on a square rod in a Tokay vineyard. According to the Los Angeles Chamber of Commerce, it takes about thirty or thirty-five years to really get to heavy production and in this particular case this weed was sprayed in a 35-year old Tokay vineyard. The farmer who had read all the publicity decided that there was no need

spraying a square rod because he was sure that it would kill this weed, so he sprayed three acres. About thirty days after the spraying, Dr. Robbins of the Experiment Station and myself and our plant pathologist were called to look over the vineyard and the vines. It was very evident that the vines were going to die. The dogbane, however, was growing and was going to survive.

We have another condition in Southern California where an individual sprayed morning glory on a 20-acre grove of fine trees. Instead of taking a few of the groves he treated all the morning glory at once and he got good control, but as far as the commercial application was concerned, it was good but the new growth on all the trees showed symptoms of 2,4-D. We do not know just what the effect is going to be on the tree or the crop this coming season, but I definitely know that he had injury.

The interesting thing is that in California, there has been morning glory ever since there was a California because it was introduced early and spread over the entire state.. So many individuals think it is going to be impossible to live another year with morning glory. Therefore, as a result, we have had some very serious injuries.

We have another situation in the Southern part of the State, where an individual was very much interested in getting rid of the morning glory in order that he could plant a bean crop. He treated morning glory and within about three weeks he prepared his soil for the planting of beans and planted them with the result that he had about one-half a stand and those beans that did come up were very badly out of shape and twisted and the symptoms of 2,4-D again showed up. It has been noted generally throughout our work and our soil types that 2,4-D definitely serilizes for at least thirty days, if not longer, and the Oregon report says that there is an injury to the soil if not longer. So we have to take this into consideration, and the practical application of 2,4-D.

2,4-D has a place, but I think we are going to have to know how to handle it. We are in hopes that the time is coming in the not too far distant future when we can have commercial operators and I believe that is going to answer many of our problems.

We have licensed operators now for other phases of pest control in California and these operators have to pass an examination in order to register. Although it is not a very complicated examination, it is evident that they have to know something about the characteristics of the material that they are using and what it will do to other plants as far as injury is concerned.

I believe in this material--as complex as it is, and as the reports show this morning, there is a very small amount of injury to other plants. We are going to have to have trained men to handle it--without this, I think we are going to be trouble shooting for a long time because I don't think the ordinary layman is going to be able to handle it in a manner wholly satisfactory. We have found that, as far as our work is concerned.

Some of the work carried on by our experiment station is of interest, I believe, in that they have taken three or four different soils and have planted peas, being quite susceptible to the material. It is found definitely that the concentrations used in weed control, especially if it is applied heavily, will cause injury, and another expert carrying on this, is attempting to find out how long 2,4-D will remain in the soil. In this the boys are using the same soil types and growing oats and peas, letting it come to maturity or almost maturity and cutting it and allowing it to deteriorate. Then they are planting again and when I left it the last time I checked and there had been a 60-day period elapsed since the soil was treated and there had been two complete crops grown. It was very definite that 2,4-D was leaving the soil, but it did appear that it would take at least 90 days on some of these soils to get complete leaving or removal of 2,4-D. The soil is a factor. It was found that with the three soils tried, one was particularly toxic and the toxicity remained in the one soil a much greater period of time than at any other. In these three soils tested, one retained the 2,4-D much longer than the other, while the other was an intermediate soil type, so we have soil conditions to which we should give consideration. You have heard a great deal this morning about lawn weeds and the spraying and there is one thought that was brought up at our Conference last year and that was the effect of 2,4-D on the bacteria of the soil. We had one rather elementary test made where one of the men on the campus had treated his lawn for weed control and immediately following the application of 2,4-D he applied ammonium sulphate. He noted that the grass did not respond readily following this application of Ammonium Sulphate which let him to believe that there might be some disorder as far as the

microscopic bateria of the soil was concerned.

There is some work that is going to be carried on in order to ascertain whether or not heavy applications are going to effect beneficial bacteria.

I would like to have your permission, Mr. Chairman, to call on Mr. Harston from Wyoming who can give you a little report on what is happening in Wyoming, and Mr. Mercer from Montana, who might give you a report for Montana. I did not mention those two states because I knew they were here and you might like to hear from them.

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DR. WORZELLA: If any of these gentlemen would like to say something you can come up now.

MR. MERCER: I would like to ask Mr. Litzenberger to make that report. He is doing the Research work.

MR. LITZENBERGER: I don't know whether or not this is the place to make my report or not. Perhaps this afternoon might be the place, but I think I can make a few statements here as to what we are doing in this respect. We are doing our part in this 2,4-D program. I was looking through my field book last night and found that we had treated something like 900 square plots with either Sinox or Sinox Dust and 2,4-D products. Some of you people have quite large programs and some of these experiments are now ready for observations and comments and possibly even recommendations. In other cases, I think probably the best thing we can do is to more or less keep still and observe them again in 1946 and perhaps then we might be in a better position to make either favorable or unfavorable comments. I think we can definitely say that 2,4-D has a place in lawn work and we don't quite agree with some of the weeds listed as being susceptible to 2,4-D. We have found that chickweed has been quite resistant to 2,4-D experiments but dandelions and ground ivy are very susceptible. We have been getting eradication between 95 and 98 percent with some of the better 2,4-D treatments, whereas with some, we have been getting only perhaps from about 25 or 30 to 60 percent control of those same weeds. We have had quite a difference in commercial brands in relation to control, as contrary to what was reported this morning. We do have differences in commercial brands. One preparation with the 1000 ppm concentration has given us about 35 to 40 percent control. In order for that same preparation to give approximately 90 percent control or better we have to double the concentration, or the amount of 2,4-D applied to a given area. Among the best 2,4-D compounds that we have tested, Weedone, Weedicide, Weedinol M-1 were among the best, whereas Carbowax was poorer, and so was Dow. We decided Chipman's is one of the better ones.

We did have differences in commercial preparations and point out the fact that I think we must test the various preparations more extensively.

As far as Montana is concerned, we recommend the use of 2,4-D for long weed control. I suppose I am taking up a little bit too much time. Perhaps I might comment further on some of our observations this afternoon.

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MR. HARSTON; Wyoming, State Eulonialogist: My remarks will be brief and concerned chiefly with the regulatory function of weed control. We did find that we could get all of the ranchers and county inspectors, as well as our offices interested in putting out some of these products on field tests. As a result of that, we have asked for a report from all of those putting these various 2,4-D products out and for the location, name of weed, date of application, temperature, humidity, and other physical factors that entered in, and the date of observation. Some of these observations came from untrained personnel and some of them came from those trained in weed work. We have had an answer from 23 different individuals and 60 different applications represented in those reports. Weedone, Weedicide M-1, Chipman's 2,4-D and two different formulations of the DuPont people were applied.

Our best results were obtained on bindweed, in keeping with the report here today. Canada thistle was not quite so good and Russian knapweed, very poor. We had one plot that we tried it on cattails and it did a fair job. It did a poor job on larkspur. The results were from no control at all to 100 percent control. The results also showed that from a few inches to as high as 12 inches in depth seemed to be effected on the vertical roots.

We are trying to learn all we can, and that is why I am here. If any of this information has been helpful, or if any additional information which I may have in these more detailed reports would be helpful, I would be willing to share with any of you later on.

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DR. WORZELLA: Mr. L. W Kephart, as you know, is in charge of the Weed Investigation with the United States Department of Agriculture and he will discuss the experiments in other areas.

REPORT ON 2,4-D EXPERIMENTS IN OTHER SECTIONS OF THE U.S., L. W. KEPHART
U. S. Department of Agriculture

There have been very little experiments outside of these two conference areas, and they have been on such a diverse collection of plans that no one man could boil them all down. I thought it might be more interesting if I picked out some points that you had mentioned only briefly, but which have come to my attention in the course of traveling around.

I have not done much 2,4-D spraying myself. You fellows have done the work. I have come along later and been carried around in your cars and looked over your plots. That has been my contribution. I have traveled 15,000 or 18,000 miles in all parts of the United States except New England and in the course of that, picked up a lot of ideas and I jotted down some of these things not stressed particularly, but that we are going to have to think about.

One thing that we have been asked about a great many times is whether 2,4-D is injurious to grazing animals. That is going to be pretty important if we are going to use it in pastures. There has been one case where they sprayed and then turned the cows out in one area and the sheep in another and there was no adverse effect, whereas the weeds were pretty well cleaned out. That is the only proof I have that this can be used in pastures, but please do not accept that as the final word. Several are working on that and we expect to have more information in another year.

The effect on human beings has come up. I have been shown that some people have an allergy to it. That is all very vague as yet, and you will have to wait for awhile until we clear that point up. However, it is not too dangerous to handle this in ordinary quantities.

The question is always coming up, to an inquisitive man, "What does 2,4-D do?" We know that it acts differently than any other herbicide. There have been explanations in the newspaper and some advertisements have been even worse. The only definite information that I have on it is that after you put 2,4-D on a plant there is a very marked disappearance of starch in the plant. These ideas that 2,4-D causes a plant to outgrow itself, or grow too fast for its own good, are probably wrong. I am going to ask Dr. Mitchell to discuss that for you this afternoon.

We have had two or three striking illustrations of 2,4-D on starch. A fellow from New Jersey who was my boss when I first went into this field, sprayed 2,4-D on a yam or sweet potato which grew through the East and down South and has a terrifically large root. The vine was about the size of a sweet potato vine and there was a build-up of starch in those roots. One spraying of 2,4-D caused the roots to disintegrate.

Professor Harper, down in Oklahoma has been working this summer to control a weed confined to Oklahoma--spurge nettle. It has an abnormally large root full of starch and he sent me some photographs of a treated and untreated root. The treated root is completely disintegrated.

That may not be the entire answer to this thing, but at least, I think you are fairly safe in telling people that it does result in the disappearance of starch. Where it goes to, I don't know but that is another matter that needs a lot more work.

Another important matter is the effect of 2,4-D on the woody plants. There is a large prospective use for things like that. Millions of usable lands in the United States are occupied by worthless shrubs. Dr. McCall mentioned that last year when he spoke to you. If we can find some cheap way to kill those things, and it is going to have to be cheap and easy, it will be a great deal of help. These shrubby things are even more selective in their response to 2,4-D than the herbaceous things.

There are many areas badly covered with oaks that are almost immune to treatment with 2,4-D whereas the locust is very sensitive. We did get in on a discussion on

that, but I do want to mention poison ivy and honey suckle because they are the only noxious weeds we have at Beltsville.

Briefly, we are not ready to say that 2,4-D is the answer to poison ivy, but I think it might be the answer to honey suckle. We found that honey suckle seems to be very sensitive to 2,4-D.

The effect of 2,4-D in the soil is certainly a very important matter that we must find out about. In some experiments that we had out in Idaho, they had quite a series of various plants as effected by 2,4-D and they planted a number of species of grasses and the grass grew well after they sprayed with 2,4-D--they reached practically normal size. But when I was out there in early October, they pointed out that you could take ahold of one of these clumps of grass and lift it right out of the ground. It had certainly no root. The same is true of most of the perennials that they use out there. It struck me as most peculiar.

They planted various kinds of corn at various intervals. Some of it grew well, but it had no brace roots. You could push it over by hand.

Incidently, there is going to be quite a demand and quite a number of people who are going to use 2,4-D to treat corn fields. Somebody has to settle that point very quickly, whether you can safely spray corn.

Last spring, we had a report from one of our men down in New Mexico working on cotton. He put some 2,4-D on the cotton and it killed the weeds and also killed cotton because cotton is one of the most sensitive of all plants, and in trying to find out just what had happened, he made a discovery which is not news to you. You can get a 2,4-D injury from volatilization of 2,4-D. You don't have to get 2,4-D actually on the plant. After having convinced himself that spray or dust would have injured the cotton, he couldn't understand why he had gotten this from fifteen or twenty feet away. He built a flat tank and filled it with 2,4-D solution and placed it on the cotton plants. The obvious conclusion was that it volatilized and killed it.

We had the same experience in some greenhouse work. Several greenhouse people couldn't wait. They had to do a lot of weed killing without knowing anything about it. This person had a greenhouse full of Poinsettia plants and he sprayed carefully underneath the benches and the Poinsettias died. They must have gotten it from volatilization. One of the things that I ran into everywhere I went was the fact that some people had gone out in advance of any real information and sprayed a lot of weeds with 2,4-D and gotten wonderful results. As late as last September we went into several areas where people were throwing their hats in the air because the bindweed was dead, so far as they could see on the surface. We dug into the ground to see what happened to the roots and their reaction when they saw some apparently live roots, was pitiful. We hope that is not going to happen any more. We have gone through a stage, but we have to be pretty cautious about this thing.

There has been a number of tests where there has been a difference in the 2,4-D. Mr. Litzenberger said there was no apparent difference, they all seemed to be about alike. I have seen several cases where there was a decided difference.

Now, who is going to test these things, and who is going to be the umpire? I have the names of over thirty concerns that expect to go on the market with 2,4-D formulations next year. Some of them are among the largest chemical companies. Some of them are going to be merely processors and distributors, but they are going to have a lot of new things and there are at least a dozen things that are going to be put on the market next year. Who is going to decide which is any good, and for what? The department of Agriculture in Washington would be expected to do that job and frankly, we do not have the organization for it at all. We have done quite a bit of it--Dr. Stahler, Mr. Timmons, and a lot of you have done that, but we are busy with other things and there should be some way that these things can be carefully checked against each other to keep ourselves lined up on this. It struck me, every where I have gone, that there is still a great deal of need for some down-to-earth scientific investigations of why 2,4-D will work on some species and another may not be effected. Is it because 2,4-D does not get into the leaf of the second plant, or if it does get in, how does it get in there? What does it do after it does get in there? Those are matters of a very great importance and a good field where someone could make a good reputation for himself. Otherwise, we can go out in the dark continuously and get rough ideas, but it warrants more than that. I submit it for your serious consideration.

You can't find from the looks of a plant whether it is going to be sensitive to 2,4-D. For instance, most of you have noted that milk weed is unaffected. You can burn the leaves off but on the whole, the plants with the heavy waxy leaves are not likely to be injured. Down South they have a terrific problem. They have these weeds which fill up the sloughs down there and the War Department has been spending thousands of dollars a year so that boats can get through. Now they have been told to really find an answer to it, by Congress. That came along the same time as 2,4-D. 2,4-D or something similar might be at least part of the answer because this plant has a smooth leaf, but it is extremely sensitive to 2,4-D. You can't tell by the looks of a plant what it is going to do. Why is it that some plants with hairy leaves are easily killed and other are not? Obviously, it is not because it has a mass of hairs that keeps it out. One very common observation is that the action of 2,4-D is almost always downward. There is very little lateral movement. You have all seen the vertical roots killed. This is right at the junction. One man said to me it looked like 2,4-D was tied up with graft.

I have jotted down some of the things that need to be done. There are many others, and I hope this afternoon many of those things will be brought out.

One thing we have certainly got to do is to find out what the factors are that effect this thing. The factor of temperature, humidity, etc., because 2,4-D wouldn't get very far if you have to tell the farmer that if he does this and doesn't do that, and things that he can't control any way--it has to be something that we can tell him to do and it will kill. Too many other things are too dependent on climatic conditions. Iron sulphate, for instance, works fine if the weather is on your side, but if the weather is not on your side, they never get their money back. So 2,4-D is going to have the same experience unless we can get around some of these things. Right now, we have to be pretty cautious and I think a lot of people have emphasized that in questioning whether these plants are dead. We often find that we have killed a considerable amount of the root, but you have noticed that these lateral roots have not grown. They had plenty of time to set up sprouts, but they haven't. Are those roots dead, but you don't know it, so to speak? Unless we do those things we have to be cautious about telling anyone what is going to happen to those perennials. We have tried to find out but the only real answer to this is going to be in nature next spring. We won't know the answer until perhaps June or later, but if anyone wants a job this winter to go into that, be careful of what you say.

That covers the things that I jotted down here. I have a number of things that I want to talk about, but I think we can run them in this afternoon and I hope that you will have this in mind, to ask any definite questions that you have and we will try to have someone answer them.

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Meeting adjourned at 12:15 P. M. Tuesday, November 27, 1945 until 1:30.

TUESDAY AFTERNOON SESSION

The Tuesday Afternoon Session of the North Central Weed Control Conference was called to order in the Spanish Room of Hotel Lowry, Tuesday, November 27, 1945, at 1:45 P.M., by Dr. Worzella.

DR. WORZELLA: We are a little behind on this morning's program, and didn't have much time to eat, but most of you look pretty well fed.

We are going to carry on now with the speaker that was carried over from the morning program on 2,4-D Experiments in Canada. The report will be given by Mr. George Knowles, Agronomist from the Experimental Farms at Ottawa, Canada.

REPORT ON 2,4-D EXPERIMENTS IN CANADA, GEORGE KNOWLES, OTTAWA, CANADA

Mr. Chairman, and Gentlemen. On behalf of the Dominion of Canada Experimental Farms, I wish to tell you how very, very pleased we are, and how very grateful we are to this committee of the North Central States for the opportunity of cooperating with them in carrying out such a very splendid program. I got to know quite a number of people here through correspondence, and I often thought how busy they must be, and how kind it was of them to adopt us to the thirteen they already have. We certainly appreciate this opportunity.

For myself, I want to tell you how very glad I am to be here. I have been engaged in weed work for over ten years and have never met so many people interested

in weed work, and certainly, I have never heard so much valuable information. I was just saying this morning that I wish that I could digest a little bit of what I heard, and I was assured that this afternoon would be given largely to digestion. So keeping this in mind, I am not going to add anything very heavy.

Experiments with 2-4-D were conducted at nine Dominion Experimental Farms on twelve different species of weeds, and these weeds contain six annuals and six perennials.

The weather in Canada in 1945, especially in the early part of the growing season was rather unusual. These few extracts from the Meteorological Service weather map may give a brief, but general picture of the 1945 season in Canada.

> "March was abnormally mild over the central part of Canada. From the Eastern Prairie, eastward to Quebec City mean temperatures were from ten to fifteen degrees or more above normal. There were generally moderate excesses in Eastern Canada and over the Western Prairies."

April mean temperatures were generally below normal from the head of the Great Lakes Westward to the Pacific Ocean. In the Atlantic Provinces temperatures were two to seven degrees above normal. Precipitation in April was above normal over the greater part of the Central and Northern sections of the grain areas of the Prairie Provinces. Excesses were reported almost everywhere in Ontario, Southern Quebec and New Brunswick.

The mean temperatures in May were below normal over the greater part of Central and South-Eastern Canada. In Manitoba and Saskatchewan temperatures were from five to eight degrees below normal. Precipitation was generally above normal from Central Ontario east-ward to the Atlantic. Rainfall was below normal, over most of the western wheat region, except in South-western Alberta, Southern Manitoba and Southern Saskatchewan.

In Central Canada the first date of seeding was unusually early, then a period of wet weather delayed the bulk of the seeding until early in June. In the greater portion of the Prairie Provinces seeding was later than normal on account of wet weather. From June on, the weather over the greater part of Canada, conformed pretty closely to normal.

The Effect of 2,4-D on Annual Weeds

All the annual weeds enumerated, except Russian thistle, appeared to be rather easily killed by 2,4-D sprays. Russian thistle, however, except when the plants are very young, appears to be quite resistent to attack from this herbicide.

When the treatments were applied on June 20 at Swift Current, Saskatchewan, on Russian thistle in grain, the youngest thistles were killed, while some of the more mature plants were killed by the heavier rates of application, but the growth of those which survived the treatment appeared to be stimulated.

The Effect of 2,4-D on Perennial Weeds

The top growth of the six perennial weeds on which 2,4-D sprays were applied was killed by the treatments, but an examination of the roots of these perennials was in most cases rather disappointing. In the Ottawa district where the treatments were applied to field bindweed and Canada thistle, an examination of the roots of these perennials was in most cases rather disappointing. In the Ottawa district where the treatments were applied to field bindweed and Canada thistle and examination of the roots of these two weeds showed a considerable amount of decay down to a depth of from 8 to 10 inches, but within this surface layer of soil there were a few healthy shoots ready to emerge. Below the 8 to 10 inch layer of surface soil, however, there was an abundance of normally healthy roots. At other points in Canada, where 2,4-D tests were made, no root injury to the perennial weeds was reported. In fact, one experimentor in Manitoba reported an increased root growth of leafy spurge due to 2,4-D treatments.

The reason for the less promising results on perennial weeds at the Branch Experimental Farms, as compared with results at Ottawa, may be due to the late arrival of the 2,4-D formulations. Because all the 2,4-D materials were first collected at the Central Experimental Farm, Ottawa, and then shipped to the various Branch Farms, this delayed the commencement of the treatments on these farms.

Results of 2,4-D Treatments on Lawn Weeds

Nowhere did the effectiveness of this new herbicide show up to better advantage than on the control of weeds in lawns. Dandelions were found to be most susceptible to attack from 2,4-D treatments. The action was slower on plantain, but this weed also disappeared. Other species of weeds eradicated are ground ivy (Nepeta hederacea) heal all (Prunella vulgaris). Practically all the treatments removed the clover, as well as the weeds. The removal of the weeds and clover took away some of the green appearance and made the treated portions of the lawn stand out to some extent in contrast to surrounding untreated areas.

Weeds Resistant to 2,4-D

In lawns ox-eye-daisy and the chickweeds appeared to resist the 2,4-D treatments which were used. It has already been pointed out that Russian thistle, especially in the more mature stages of its growth, is also quite resistent. Purslane, an annual weed which is most prevalent in vegetable gardens has not been injured by the concentrations of 2,4-D which readily killed several other common annual weeds.

Two common perennial weeds in Eastern Canada were quite immune to injury from all treatments for perennials. These are, bladder campion (Silene latifolia) and toad flax (Linaria vulgaris). Couch grass, and other weeds of the grass family, were not effected.

Selectivity of 2,4-D Sprays

The selectivity of this new herbicide is remarkable. This characteristic was first observed when practically all the dandelions were removed from a badly infested area on the Central Experimental Farm lawn with no apparent injury to the grass. It was again observed when Canada thistles were most effectively controlled on a field of barley with no apparent injury to the barley. Similar results were obtained with the control of field bindweed in a crop of oats. Several species of annual weeds were killed in a crop of millet without injury to the millet. Annual weeds in corn were killed without killing the corn. Canada thistles were effectively controlled in pastures without appreciable injury to the grass.

At Kentville, N. S., Dows G. 506 did not kill the clover when wild radish was controlled in a field of oats seeded down to grass and clover.

Flax appears to be on the border line. It looked rather sickly after it received a 2,4-D spray to control annual weeds, but later it recovered.

Turnips, mangels, and carrots, however, were found to be as susceptible to injury from 2,4-D as the weeds which accompanied them.

Herbicidal Action of 2,4-D

In a general way, it appears that the herbicidal action of 2,4-D is quite rapid when plant growth is rapid and discouragingly slow, when plant growth is slow or dormant. Under all condtions, however, its herbicidal action is much slower than Sinox and the other commonly used weed killers. The slow action of 2,4-D was observed at Ottawa on three different occasions. The first was in the spring when it was applied on dandelions in a lawn. It took almost a month for the dandelions to disappear. The next occasion was when Canada thistles in pastures were treated in July, they were in bloom then. It was almost a month before the top growth turned brown. The slowest action of all occured when a portion of a roadway on the Central Experimental Farm, which was badly infested with dandelions and plantain was sprayed with a 2,4-D on September 6. Action was so slow in this instance that it was feared some mistake had been made in the concentration. Then, two months later it was observed that practically all the dandelions and plantain had disappeared.

Contrasted with this slow action was the rapid herbicidal action which followed when field bindweed and Canada thistle were sprayed about the middle of June when the growth of these two weeds was very rapid. The Canada thistle was sprayed at 5:00 P.M. and the following morning all the thistle in the treated plot showed the characteristic drooping of the heads and in about one week the top growth had turned brown. The field bindweed was not observed until five days after the treatment and at that time all the bindweed foliage was wilted and was sickly yellow in color.

Rates of Application of 2,4-D

In the case of field bindweed, for instance, it was surprising to find that a light application of Dows A 510 ppm using 3/4 gallon per square rod had caused just as much injury to the roots as a heavy application of the same formulation using 2 1/4 gallons per square rod. A somewhat similar observation was made in the case of Canada thistle. It would seem that a plant is capable of absorbing a certain lethal dose of 2,4-D, beyond that there is no advantage of applying more. It is not a case of "If a little is good, a whole lot must be better."

2,4-D Applied on Bindweed Around Young Apple Trees

A young apple orchard on the Central Experimental Farm has become rather badly infested with field bindweed. In many instances, there is a dense mass of this weed growing around and climbing up the trees. Four of these trees were sprayed on July 30 with Dows A 510 at the rate of 5 grams per gallon. Sufficient spray was applied to wet all the foliage. This treatment appeared to kill all top growth of the bindweed but on August 24 a slight amount of regrowth appeared and on that date a second application was made at the same strength as the original application. At the end of September, practically no regrowth had appeared and so far as could be observed, there was no injury to the apple trees.

Next year, this treatment will be continued, if any regrowth of the trees will be observed.

The Effect of Rain Soon After Applying 2,4-D

It is well known that some herbicides are rendered ineffective if washed off by rain soon after they were applied. In order to determine if this were also so with 2,4-D sprays, a number of square rod plots on a weedy portion of a lawn were uniformly sprayed with 10 grams of Dows A 510 in one gallon of water. Then, at two hour intervals, a plot was sprayed with water at the rate of one gallon per square rod. These treatments were commenced at 9:30 A. M. and two plots had been resprayed with water, one at 11:30 A. M. and the other at 1:30 P.M., then at 2 P.M. a thunder storm brought a light rain of .06 inches. This completed the experiment. Later observation showed no marked differences. The weeds were well controlled in all plots. It is realized, of course, that one gallon of water per square rod represents an extremely light rain, nevertheless, the thunder storm which came five hours after the 2,4-D was applied helped to verify the belief that rain soon after applying 2,4-D may not neutralize the effectiveness of this herbicide.

Comparison of Various Formulations of 2,4-D

Various formulations containing 2,4-D were used in experiments at Ottawa. Some of these were received too late to be included in the earlier treatments.

With one or two exceptions, there appeared to be no outstanding difference between these various formulations. On examination of the roots of field bindweed, treated with several different samples containing 2,4-D, Weedone seemed to have caused slightly more extensive root injury than the other formulations. One of DuPont formulations, in every instance acted very quickly, but was ultimately much less effective as a herbicide for perennial weeds than was most of the other brands.

2,4-D as a Growth Stimulant

When conducting Experiment V1 as outlined in the uniform plan of experiments, that is "Tolerance of Crop Plants to Residual 2,4-D in the Soil" one of the most remarkable results from the use of 2,4-D was observed.

The plan calls for the application on the soil in early spring of Dows A-510 1000 ppm at the following rates:

3/4 gallon per square rod
1 1/2 gallon per square rod
2 1/4 gallon per square rod
10 gallons per square rod

Then plant various crops in season.

Due to the late season and pressure of other work, the 2,4-D was not applied to the soil until the first week in July. The following crops were seeded a few days later across the treated and untreated strips: flax, peas, barley, soya beans, and corn.

It was soon observed that flax was very sensitive to the presence of 2,4-D in the soil. Its growth diminished as the rate of application of Dows A 510 increased. No flax grew on the plot which received the heaviest application of A 510 or 54.00 grams per square rod. There was very little flax on the area which received the next heaviest application of 12.15 grams of A 510 per square rod. There was approximately a 75 percent stand on the plot which received the lightest application or 4.05 grams per square rod.

A somewhat similar though less pronounced picture appeared in the case of peas, and soya beans. Barley appeared to be uninfluenced by any rates of A 510.

Corn, however, showed a remarkably favorable response to all rates of application of Dows A 510. The first three rates of application caused an increased growth of corn, which seemed to be in proportion to the amount of A 510 applied. The heaviest application of A 510 appeared to be too much and this was reflected in a slightly lower yield than on the plot which received only 12.15 grams of Dows A 510 per square rod.

Just before harvesting this corn, duplicate rod rows were removed from each of the plots and the following are the average weights of these rod rows.

Increased Yields of Corn, due to Application of Dows A. 510

Check					6.5	pounds
1000	ppm	3/4	gal. per	sq. rod	7.5	"
"	1	1/2 "	"	" "	9.5	"
"	2	1/4 "	"	" "	13.5	"
"	10	"	"	" "	12.5	"

It should be pointed out that this experiment was conducted on rather poor sandy loam soil which had received little fertilizer in the past ten years, and as already mentioned, all the indicator crops used were not seeded until the first week in July. This is at least six weeks later than the normal date of seeding.

Now, gentlemen, I hope that I haven't whiled away my time, and I thank you.

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DR. WORZELLA: We appreciate getting the results from our close friends from the North, and we all know that weeds do not have any boundaries.

Our morning program has been completed, although we are a little late, and I will now turn to the Moderator of the afternoon program, whom you already know, L. W. Kephart.

MR. KEPHART: This afternoon I went to the dictionary to see what I was supposed to do, as Moderator. One definition was "the presiding officer at a meeting of Presbyterian Ministers," and down further I found that another definition was "one who referees." Perhaps this is what I am supposed to do. I suppose the reason that I was asked to be moderator was because last year I had the temerity to speak on new chemical weed killers, and in doing so, I not only stuck my neck out, but went out at the end of a limb and stuck my neck out. Now I am being held responsible for my courageous behaviour.

As I said this morning, the program, as it was given to us, included what appeared to be addresses by five gentlemen, and they each assured me this morning that they had no address to make. However, I feel that most of them are prepared to speak informally, and I think this is the best way to conduct the meeting this afternoon.

Make yourselves comfortable, and this is just between ourselves. If you want to ask questions, don't hesitate to break in at any time.

One gentleman who did not decline to talk, is the first one on the list. I think it is very appropriate that he be here and meet you, and that you meet him, because so far as I have positive knowledge, he was the first man to actually try

2,4-D for the purpose of killing weeds. He is the one who has gotten us into this mess. The gentleman is Dr. John W. Mitchell, my associate in the Bureau of Plant Industry. I am happy to present to you, Dr. Mitchell.

DR. MITCHELL: That was a very flowery introduction, and I am sure that I don't deserve all that credit. There are a lot of people in the audience who have done as much, if not more, to push the thing along. I might say, by way of explanation, that there are a number of us who are interested in the study of plant growth regulating substances.

The results they have given us have helped a great deal. None of us claims to know very much about the control of weeds. We started this work at Beltsville about eight or ten years ago. The study of these compounds, synthetically, to bring about growth responses in plants, we had been interested in that mainly from the standpoint of plant growth regulators, rather than from the aspect of weed control. It was only about ten years ago that work first started in these growth regulating compounds, and one of these first responses made use of, was the response in the dipping of cuttings. In certain instances you could induce them to produce more roots, but if you dipped them in the solution too long, we noticed that it inhibited bud growth. These compounds might be used as herbicides. I think Dr. Kraus was one of the first people to have this clearly in mind. The difficulty was at that time, that our best plant-growth regulator was naptholene acedic acid. This wasn't good enough to be used in this way. It couldn't be used on a large scale.

Shortly after this, Dr. Zimmerman found that some of the dichlorophenoxy acetic acids were used as growth regulators, and we go ahold of some of these compounds and were surprised to find that they were by far the most potent ones that we had ever seen. For instance, they had brought about responses to the plants they were applied to. This pepped up the use of these compounds for herbicides and the work stimulated by this discovery, and this compound could be made rather cheaply. The work was intensified and we soon found that quite a number of plants could be killed and that these things had possibilities as herbicides.

That gives you a background as to the part in developing the use of these substances as herbicides. I don't want to take too much time. I know a lot of you have questions to ask and things to say, so maybe you want to get along with your discussion.

MR. KEPHART: I think I mentioned this morning that the fact plants outgrow themselves when you put on 2,4-D, is not correct. Dr. Mitchell, what is your conclusion?

DR. MITCHELL: I mentioned that we were working on growth regulators, but I don't think we can answer all the questions. If you put on a small amount of substances like 2,4-D on plants, you do get increased growth in some parts of the plants. You get increased cells, and increase in size and weight of certain parts, while other parts are inhibited. If you put on larger amounts of these compounds, then I don't believe that is true. At least, our results would indicate that you don't get a stimulation of growth. For example, we found that these compounds greatly inhibited expansion and development of buds and if ten-millionth of a gram were placed on one place, it was rather small. We have found that the expansion of that leaf may reduce as much as 85 percent, and the production of new buds and leaves is greatly reduced. So for large amounts like you people have been using to kill weeds, I don't believe we can say that the plants actually grow themselves to death.

MR. KEPHART: The effect seemed to be that it seemed to destroy the starch. Would you tell them what you told me about that?

MR. MITCHELL: When morning glory and annual plants were placed under conditions where they would develop some starch, they had 18 percent starch in the whole plant when we started the experiment. We sprayed with 2,4-D, on some of the plants, and some we left untreated. The ones we sprayed with 2,4-D lost their starch within two weeks. It went from 18 percent to less than 1 percent. At the same time, the sugar content of the plant went up and the leaf went up as much as 100 percent and the whole plant as much as 50 to 60 percent within three or four days after the treatment. At the end of 21 days it was down to practically nothing. That in itself, might account for the difficulty that the plant had to survive. At the end of 21 days they were practically dead.

MR. KEPHART: Isn't it true that with a lot of our fleshy rooted perennial weeds like Canada thistle, there is a stimulation of the roots, because the root gets much thicker than the untreated. To what would you contribute that?

DR. MITCHELL: In these fleshy rooted plants, there is not such a large amount of the compound that gets down there, but you do have a stimulation, and if you put on a small amount, you get the effects, and it has been shown that a small amount will produce the effectiveness.

MR. MESNE: I am just thinking out loud now. What would happen if you made that application on sugar beets? We only have one very small experiment on it, made last Fall, and it didn't increase it, it depressed it. But that isn't conclusive because that was only one small experiment. It was applied to the leaves while still in the field and then fifty samples were analyzed for sugar and we found less sugar in the roots of the treated ones. Was that due to increased respiration? We have found as much as 37 percent increase in the amount of respiration in the plant treated with 2,4-D.

DR. STAHLER: I have been asked about this growth several times. What is it due to?

DR. MITCHELL: Dr. Kraus has been doing a large amount of work on various plants, and he has found that the production of new cells is greatly stimulated and gives this tumor that you get on the root or stems of the plants. If you put minute amounts on the stems you can get cell elongation. We have used it in some of our animal toxicity tests and there we use small amounts--one-tenth to five-tenths of a microgram, so it takes a very small amount to bring about cell elongation.

MR. KEPHART: I would like to ask, is there a killing effect of 2,4-D when used on plants in the shade, and not in the sun? Also, there is said to be sometimes a difference in the killing that you get in the morning and at noon. Are those things in any way related to the things you have been speaking about?

DR. MITCHELL: Maybe that might be due to environmental factors. Recently we have experimented along that line. We took a bunch of bean plants and treated the leaves with 2,4-D. Then we divided them into three different groups. One group we placed so that it would receive ordinary sunlight and the second group we placed in the shade and the third group in darkness. There was a very great difference in the response of those plants. The group in the darkness continued to grow, and the plants behaved as though nothing happened. The group in the sun showed 100 percent curvature of the stem and inhibition of bud growth, so I wonder if light may not be a factor which may account for the variation in some of the results.

MR. KEPHART: I don't want to ask all the questions, but I have been thinking about some of these things for a long time. Someone asked whether 2,4-D has any effect on bacteria. That has several implications, first, does it effect bacteria in the soil? Why don't these roots that have been subjected to 2,4-D for some weeks, decay? Is it because they can't decay? Have you any observation on that angle?

DR. MITCHELL: We have worked along that line a little bit, in connection with bacteria. We found that the growth of some of the positive bacteria were inhibited and some of the negative bacteria were not effected. We found that we could germinate some of the fungi that we had isolated from plants. We found that we could use 2,4-D to prevent the growth of some of this positive bacteria in which we were trying to grow fungi. In other words, with 2,4-D we could control the growth of some of these and that doesn't mean that bacteria was cut down by 2,4-D. We had some soil to which we added 2,4-D and we made bacterial count on that and found some reduction for a period of four weeks after we treated the soil. Which ones were reduced, we can't say. In general, 2,4-D couldn't be considered a serious handicap to the growth of bacteria, and I am sure it is not to the growth of fungi.

MR. HANSON: I have one question I am wondering. I know you don't have the complete answer to it, but do you have any plausible clue as to what is the reason for the selectivity of 2,4-D, that is the selectivity for certain species?

DR. MITCHELL: No, I am sorry I can't come anywhere near answering that one. If any of you put the same amount of 2,4-D in the soil on different plants, you get different responses. The broad-leaved plants are susceptible to 2,4-D. I mention this because a lot of people have suggested that it is the shape of the leaf that answered the question. It doesn't stick on the flowers as well as it does the broad-leaf plants, and I don't believe this is the whole answer because if the roots are

exposed to the same amount of the soil, then you still get a decided difference in the results that you get. We still don't know anything about this.

MR. HANSON: Do you think that there might be selectivity within a species as well as between species? I have been wondering about that and I imagine other men, as well. Dandelions led me to wondering last spring. Some of the plants were killed completely and others showed no apparent effect at all. I know some of those that showed no effect at all had just as good coverage. At least, I am assuming they did. There is no reason why they didn't have. I am wondering if there should be selectivity within a species?

DR. MITCHELL: No, I don't recall of any case like that. We have no example of differences within a species.

MR. JONES: We have had examples this morning--variation in response of Chickweed. We have taken a hundred experiments and found that they have had a variation of 100 parts to 2000 parts per million, or twenty times as much to kill some Chickweed plants as others.

MR. KEPHART: Mr. Jones has made a lot of nice observations. I would not know how to start. We have got to have a lot of technical work on these things. Has any one any other questions?

DR. BAKKE: Any microchemical tests to determine how far this 2,4-D will penetrate into the root cells in a plant?

DR. MITCHELL: No, I am sorry we don't have any specific data for 2,4-D. In fact, it is purely guess work when we say that it goes in. It appears to go in, but nobody has isolated it from cells that I know of. We haven't been able to treat plants and get it in specific parts and then squeeze the juice out of the plant. It has been useful, however, in animal toxicity tests, but we don't as yet, have a specific chemical test unless some of the other men may have. As far as we are concerned, we don't have one and we haven't been able to trace 2,4-D in the plants. Some things have been suggested that are very hard to get ahold of right now.

MR. TIMMONS: I have a question I would like to direct to Dr. Mitchell. With reference to buffalo grass sprayed at the rooting stage, it developed that 50 percent of the burrs that developed were empty, while the normal empty content of buffalo grass was 15 percent. Not only was the development of burrs stopped because the yield was greatly reduced, but the burrs that were produced had a high percentage of empty burrs. Morning glory sprayed at the height of ten inches developed normally but no seed whatsoever was produced and no seed set in those apparently normal heads.

DR. MITCHELL: That is one we will have to guess at. In our experiments with annual morning glory we observed that the part first effected was the production of seed. The only guess I might make on that is since these compounds tend to raise the rate of respiration, and since the respiration of those parts is relatively high, it might be that is one factor in bringing about these adverse results for that part of the plant.

DR. WORZELLA: Is there any reason why 2,4-D does not move horizontally in the roots?

DR. MITCHELL: That is a good question. We have not been able to trace the movement of 2,4-D through the plant, and therefore we are shy on that kind of information. We have noted for sometime that it does travel down through the stem vertically more readily than horizontally. The only thing I can suggest is that we try to apply smaller amounts, as indicated this morning If you kill a plant too soon, you don't get the full response. If you apply smaller amounts and apply them twice, you may be able to get it further into the horizontal roots, but we have not been able to trace the movement and have not been able to make much progress along that line.

MR. TIMMONS: I believe Dr. Stahler has done a little research and he was telling me something that might throw some light on that.

DR. STAHLER: Some work has been done that showed there was very little lateral movement. It was a gravity proposition. I have done no research whatever.

DR. E. J. KRAUS: We know that if we put it on a bean leaf it reaches the stem. One of the first observations we made was that the portion above, as well as the

portion below showed effects. We call it telemorfic effect. You will see, by reading certain articles that these materials travel considerably more than the young bean plant. Whether that is the 2,4-D treatment, or some decomposition product of 2,4-D we will have to wait and see. But anyone that has two eyes, and is going to look, which is asking a great deal, will see that it travels in both directions. I don't pretend to enter into the controversy. This is the thing that got me into this, and I couldn't sit still. It does travel, and we have these varied distortions. It is because 2,4-D did such a marvelous job of traveling that it is the best germicide that you have today. We tried the others--a great many of them. I don't want to take up any more of your time, in explanation, but 2,4-D does travel up and it travels down. If you ask me exactly what the physiological effect is, you will have to wait some little time for that. If you have even a 10-cent eye and a 50-dollar microscope, you can see it. Some may need a thousand-dollar microscope and have a 1-cent eye and still wouldn't see.

MR. TIMMONS: I would like to hear Dr. Kraus speak some more on his observations. Why aren't the laterals killed, or sometimes not effected at all?

DR. KRAUS: I think you folks are focusing a little too closely to 2,4-D, if you don't mind lifting your sights just a little. One of the things that we found is that the cellular response has formed a condition upon the carbohydrates and also the nitrogent constituents in the cell. That is to say, by taking pieces of the material and supplying glucose to certain ones that didn't grow, they at once began to supply nitrogen, if they were high in carbohydrates. That helps to explain a lot of difficulties that you were working along with this morning.

As weed experts, you people may have seen that the main food supply is stored in the main roots. If you find that it is a carbohydrate, such as starch, a large part is in the main root, rather than in the lateral. It would be easy for me to conceive that the cells of the main root could be stimulated to enlargement. The lateral roots would not show the same results because of the character and material that makes them up.

The question of range within a species came up. One of the things I was working with at that time was Marigold. I gave it up because Marigold is so variable in its response. Out of the same package of seed, which does not mean very much, depending on the seed man from whom you are buying, having the same identically colored illustration of the Marigold, one plant was highly sensitive to acetic acid at .501 percent. Another plant in the same package of seed gave no response to 1 percent. It is just as you have heard regarding chickweed. There is a variation within the species.

May I speak as a botanist for a moment? Why should you deny to plants the thing that all of you know is true of yourself and of animals. You are not all equally sensitive to the same sort of drug by any means, and you can listen to symposiums from Washington on many compounds, but it is very difficult to predict physiological action in relation to chemical structure. Biologists have found that one rat may be a lot more sensitive to a drug than another. I see no reason why plants shouldn't be the same. That is nothing to marvel at. Whether we marvel or not, does not give us an explanation.

When you people work on this sort of thing, if I may say so, I wish it were possible for Dr. Mitchell and me to say what we know, but we can't. This sort of thing has been in hands, other than ours. We could give you a lot of information on these plants. Up to two months ago in all technical magazines, that was under heavy censorship. I know because I was the censor.

Lets take our eyes off 2,4-D for a moment. One of the things that we found with acetic acid, which is not so different, is that one of the most sensitive parts is the embryo. It is the easiest thing to knock out. The embryo forms into seed. Parts of the stem are completely different. We have this differential in sensitivity, not only of plants but of parts of plants. I think now that I have said enough. Thank you.

MR. JONES: I sprayed a 20-foot poison ivy strip. The leaves shriveled and the stems shriveled, but except for a slight movement downward, the unsprayed portion stayed green, because I didn't spray at least 50 percent of it. Apparently, there wasn't enough cross movement.

DR. KRAUS: I still think that there must have been some cross movement in the breathing of the cells. I would like to see such an ivy vine. There has been a great deal of controversy as to whether poison ivy is, or is not, killed by 2,4-D. It is a part of the material that is inside and this material may travel for long distances in plants and show no manifestation whatsoever, but it will show up at a distance. For example, if we take an old bean plant, and put this on one of the upper leaves, there will be no indication whatsoever that you can see with your eye, in the stem below it. Frequently, however, this plant dies, and if you look at the roots you will find all of the active growing tissue at the roots, swollen and dying. In other words, this may be traveling through cells and not leave a mark. All I can say is that if that can be put on, it leaves almost no trace. The fact that you do not see a cell change does not mean that the material has not gone through. It is like when someone said, "What is the good of soap in your garments. You don't see soap in your garments." Oftentimes it does a shirt a lot of good.

DR. PAVLYCHENKO: The effect of 2,4-D on roots is significant and was mentioned on several occasions today, but not sufficiently discussed in this upward and downward movement. I, particularly was interested when somebody mentioned that concentrated tissue was formed on sow thistle roots. We found that hoary cress always forms very large nodules, right below the surface, but no other perennial weed showed the same effect. That is one thing I would like to have clarified, if possible. Leafy spurge showed very quickly and consistently that the whole bark was swollen, but not in a form of irregular swelling. The whole root was enlarged in diameter. We sprayed several plants of leafy spurge which were grown alone and we killed it quite quickly in two or three weeks' time, but the new shoots began to appear about three to four weeks after. They all, without exception showed strong effects of 2,4-D, and yet they came out from 18 inches to two feet from the place where the original plant grew. They were curved and bleached and assumed a very reddish discoloration and died. The next crop of shoots came up two or three weeks later and they show much less effect of 2,4-D. Some of them died but some of them went to winter sleep without being killed. The third generation of shoots came up and showed little, or no effect of 2,4-D whatsoever.

Another interesting observation in connection with hoary cress--we watched it closely and found that in every case, hoary cress laterals showed swelling, and the plant still showed life. About twelve inches from the original plant, the diameter was reduced to 1/16 of an inch and the root was growing of normal diameter from that point on. The effect of 2,4-D was marked so abruptly that you could see that little stretch, as a sausage, for some time, and then abruptly, the diameter is reduced and the root is not showing the effect any more. What would be the reason for that abrupt change in the effect?

MR. KEPHART: This discussion could go on for quite a while, but I would like to point out that there is a lot of information and we are so intent on getting some answers to our questions and there are others that we haven't had time to think about, even if we could. I don't know if we have time to go into any more discussion on this, but I want to say that in case any of you are in doubt, Dr. Kraus is the one that started this whole thing. He is the first one to see that these hormone-like materials could be used for killing weeds, so I guess you can blame him, after all. There is one question that I would like to ask Dr. Mitchell. I mentioned a test that we had had down in Beltsville where we treated pasture lands, and I would like to ask him to tell you about this.

DR. MITCHELL: On the first experiment, we treated pasture lands with twice the amount of 2,4-D usually applied and then we pastured sheep and cows on this land. There was no evidence as to the palatability of the grass at the end of two weeks, beyond the fact that the animals had grazed off the grass and they were examined by veteranarians and found no toxic effect.

In the second experiment, we fed a cow five and one-half grams of pure 2,4-D a day for a period of about three months. This was placed in her grain and at the end of that time she had consumed, very willingly, one and two-tenths pounds of 2,4-D. There was no decrease in her milk production and no evident lack of palatability of the grain. An autopsy showed that there were no apparent effects on the various organs. A calf was fed entirely on the milk from this cow for a period of one month, without any ill effects. I think that the Bureau of Animal Industry feels that it is fairly safe to use 2,4-D on spraying pastures.

MR. SIEMS: This morning someone mentioned about waterweed from the South. There have been thousand of artificial ponds that have been made in recent years for the growing of fish. These ponds are artificially fertilized and in order to increase the yield of fish, what effect, if any, does 2,4-D have on the fish when used on the water weeds?

DR. MITCHELL: We don't have any information on this. I think there must be some representative of the various companies in the audience that had experience along that line. Perhaps someone would be willing to tell about that.

MR. BARRONS, DOW CHEMICAL CO.: I saw a gold fish grown for six weeks in 1000 ppm of 2,4-D and it was very lively. The Michigan State College examined it and said that it was healthy. 1000 ppm is greatly in excess of what you would expect to get in a pond.

MR. KEPHART: The effect on pond plants is something different. They exhibit just as much difference in their susceptibility of 2,4-D as terrestrial plants do.

Any more questions on 2,4-D, or do you know all about it?

MR. LITZENBERGER: I would like to make a commitment on the poisonous nature of 2,4-D as far as grazing animals is concerned. In our leafy spurge work, we had 22 horses grazing in that pasture all the time while this work was being conducted, and in addition to the 2,4-D, we had some chlorate treated plots and the horses seemed to want to stay in that area and apparently there were no ill effects from it.

DR. WILLARD: We asked our Veterinary College to conduct some tests. We are too poor to use much stock for awhile. He started with guinea pigs and with the Sodium Salt. All the stuff we could get into the guinea pigs didn't have any effect on them.

MR. KEPHART: Anyone have a case where a human was injured by 2,4-D?

MR. JONES: I got a call from St. Louis for a woman who had just swallowed a glass of Weedone Emulsion. This woman had been using this glass for measuring this material and she put it under the tap and had it down before she realized that it tasted queer. I asked them to report if anything unusual happened.

There was another case in Chicago where a Doctor drank a glass of it, and he was using the stomach pump. Another case, a woman broke a bottle and got her hand fairly well scratched, and got the emulsion over the cut. She washed it off and we kept in touch with her physician. There was no reaction.

DR. KRAUS: I have personally taken one-half a gram of pure 2,4-D a day for three weeks. You judge the results.

MR. KEPHART: The matter is closed, and the question is settled. I would like to tell an experience I had. A very perturbed voice would say when the phone would ring, "We have some weeds in our yard and we want to use some of these new hormone weed killers." She stumbled along, and then she finally said, "I am a little worried --that word hormone means a lot of things," but I don't think it does in this case. I wish Dr. Mitchell would explain what he means by the word hormone with these compounds.

DR. MITCHELL: I think maybe I should call on Dr. Kraus when he used this for growth regulators.

DR. KRAUS: The reason that I had proposed some years ago that we use the term "growth regulator" was that when these things started out, they were called "growth stimulant" but they did not stimulate growth, they suppressed it. Therefore, it was inappropriate. I have been looking at these things as a traffic policeman. In other words, these substances regulate what a plant does and it seems to me that we could say that they regulate growth.

MR. KEPHART: We don't want to take official action at this Conference as to the continued use of this word Hormone, but if we do use it, we are using it for something that it isn't.

MR. MCDONALD: As long as we are talking about toxicity, we did make a very interesting observation this summer. We were doing our best to get some slides on

weeds in different stages after treated with 2,4-D compound. We were working with leafy spurge and after harvest the grasshoppers were looking for something to eat. We let the plant stand for several days, getting it ready for the pictures and the hoppers moved in and stripped it of everything. Therefore, as far as the hoppers were concerned, it did not effect the palatability.

MR. LEAHMAN: In the discussion this morning regarding the planting of beans, I wonder if anyone has done any work in planting potatoes, as far as 2,4-D is concerned.

MR. LITZENBERGER: Potatoes were planted one week after 2,4-D was applied. 3/4 gallon brought a yield of 43 percent. 1 1/2 gallon brought a yield of 30 percent. 2 1/4 gallons, 27 percent, and ten gallon yielded 15 percent. As far as the stem was concerned, we had some decrease in stand with the 10-gallon rate. The others were 100 percent and the 10-gallon rate was about 85 percent.

MR. KEPHART: The one I was going to quote was about the same thing.

MR. BRANDIS: Not from an authentic report, but from a farmer's observation, we use Sinox, or Dow 66, I have forgotten which one, as I was using them both on his farm. He had been checking the yield from several other plots, and he swears that he got more potatoes out of those spots that he killed the vines out early.

MR. MCDONALD: There was an actual case, where the untreated potatoes were permitted to ripen naturally, a little later from the rest of the field, and there was an increase in the treated area. There were about 57 bushels more potatoes on eight rows, roughly a quarter of a mile long.

MR. KEPHART: I have one question to ask that may not be a fair question, but it is one that is in the mind of a lot of people. What chance is there that we will have a better compound for weed killing in this same category than we would have in 2,4-D? Does anyone want to discuss that, or is that too catchy. Would you want to comment, Dr. Mitchell?

DR. MITCHELL: No.

MR. KEPHART: All right, then, we will leave that until the next time.
The next is a report of the Policy Committee on Herbicides. Dr. Willard will give that report.

REPORT OF POLICY COMMITTEE ON HERBICIDES, DR. WILLARD, OHIO

The Policy Committee of the North Central States Weed Control Conference was created, I believe, at the suggestion of the group that made the tour through Kansas. It was felt that this Committee might consider the reports in some detail and make recommendations of policies connected with these new herbicides, to the Conference. These are the recommendations of the Policy Committee.
(President Yost takes over as Chairman)
The Policy Committee of the North Central States Weed Control Conference RECOMMENDS to the Conference the following statements of policy for 1946:
1. That the uniform plan of experimentation with 2,4-D and other chemicals be continued as a conference project in 1946. Adopted.
2. That the conference approve the use of 2,4-D for the control of certain lawn weeds, the qualifications and details of recommendation to be set up by each state. Adopted.

This was put in because quite obviously we got different results from different States of the Conference. The Committee did feel that the Conference might approve the use of 2,4-D for control of certain long weeds. I move the adoption of this recommendation.

3. That, based on experiments to date, this conference is not prepared at this time to approve the general use of 2,4-D on annual weeds in growing crops. Adopted.

4. That the conference approve the general use of 2,4-D on certain annual weeds, not in growing crops, the list of such weeds to be prepared by the research committee. A list of resistant weeds will also be prepared. Adopted.

5. Due to variable results and the short experimental period this conference is not in a position to recommend 2,4-D for general use in eradicating deep-rooted perennial

weeds. Adopted.

All recommendations adopted by vote of the registrants.

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PRESIDENT YOST: I want to take this opportunity to invite the gentlemen from Canada to a special breakfast in their honor tomorrow morning at 7:30 given by the officers and directors of the North Central Association.

The session adjourned at 3:30 P.M. The next meeting to be is the banquet tonight at 6:30, November 27, 1945.

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TUESDAY EVENING PROGRAM
November 27, 1945

GOVERNOR EDWARD J. THYE'S ADDRESS

Thank you, honored guests. After a good introduction like that of our toast master, it would be nice if we could get up, and nod, and you would have all the impressions of the man, because of the nice remarks of the toast master. I would like to be able to do that here tonight, but I know that there are too many of you people that have done a splendid job in the past years that I want to thank, for the job that you have done. So while it would be nice to sit down, yet, I am going to proceed to thank you for the job that you have done, and also to welcome to Minnesota, those of you that are here from other states in the union. We welcome you here, and hope that your stay, while in the State will be pleasant. If you have any trouble, I know the police departments of both cities, and we have a Pardon Board within the State, of which I am Chairman. I think that we can, someway or another, take care of whatever needs may be yours.

You know, I was a weed inspector long before I was Governor of this State. I have gone out and have tried to enforce the laws and I didn't know that it was the Legislature that provided the laws which the Weed Department used, having the local Township Chairman do the work for them. They would attend the meeting, and tell us how it should be done, and come around occasionally throughout the year and put the theory to use, to make sure that we carried out that which they told us in the spring conference. That was back in the days when we didn't have the weeds to contend with that we have today. That was back in the days when the Canada thistle was a great worry to us--that it was going to take over this State of Minnesota. The quack, also, was beyond any hopes of eradication. That was true, when we were working and tilling the fields with a team of horses and a walking plow and an old drag that we would throw a couple of fence posts on to weight it down--that was the manner of tilling. Today, with the modern machinery, it is quite common now to see them slopping the hogs with a tractor. You may laugh at that, but it is true. You drive down the highway and you will swear that that man is using his tractor to convey himself between the house and the barn. Drive down the highway some day and notice it. Times have changed. We no longer fear the quack grass. In fact, we eradicate it.

When we get a spring like last year--it got hot in August, and we had an early winter--but we can eradicate quack grass quite easily and quite readily. In fact, it is good for the soil, and we never talked like that twenty-five years ago. We have a lot of new weeds to contend with that aren't so easily eradicated.

Bindweed is one of them. You have the doctors in the field of science and experiment, making that easy for us, and so we are advancing.

A new weed is introduced to us by the shipment of grain, and at the same time, when we need a little surplus feed, they will ship all feed into our feed lots and then we spend thousands of dollars in an attempt to eradicate it after they get it spread out on their countryside. We must correct that in our legislative laws, in getting proper legislation passed to treat the grain infested with noxious weeds so that it will not be spread out over our good, clean, fertile acres, to become a menace to that community and to the entire state in only a brief period of time. New chemicals have been discovered because of this war emergency. They will be supplied us in plentiful quantities, in order that we may use them to simplify the eradication of some noxious weeds that we have, and possibly new ones that will come

from some place in the world to pester us in the future years.

You have done a splendid job, as men in the state department, men in executive positions administering the laws of the State and laws keeping, not only the weeds out of the field, but working in all matters in the State improving the conditions and helping the producers.

You have done it in these past years--you have worked well with the producer. He was short of help. He was short of many a new machine that he should have had. Yet, you have been able to control that weed pest that has taken control at one time. Some careless producer, or farmer out in some isolated corner of his farm, with one patch of Canada thistle, will find, on a certain good, windy day, that his seed is spreading over acres, in a manner that would make that farmer weep when he sees the seeds floating over his lands. I have had Canada thistles on some fields. Every time that I plant corn in that field, and keep that corn under cultivation, the next year it is peppered with thistles because it is coming in to me from one of my good neighbors. I have eradicated thistles completely in two seasons of rye or winter wheat, and then, again, you can see that same land infected by another patch of thistles just across the fence from me.

The day will come when we will be able to overcome that. We will do it with chemicals and we will do it because the people have been taught that they don't want a situation like that existing in a township or community.

It is just going to take hard, tireless effort on the part of the men and women like yourselves here, to bring that about. It is going to require a appropriations. It is going to require certain types of legislation at times to make that possible, and again I say to you, ladies and gentlemen, that it is pleasant to see all of you here. I welcome you, that are guests of Minnesota, and I know that you have had a most splendid conference, and as you adjourn from here, you will all go home with greater knowledge, higher hopes, and a greater determination than you have ever possessed before, and go back to your respective states or communities and carry out the splendid work you are doing. It is nice to be with you, and I regret that I cannot be with you throughout the evening, but unfortunately, sometimes we do have to take two meetings in one night, and I am going to have to leave to go to Minneapolis immediately.

I wish that I could stay and shake hands with all of you. A lot of you I have worked with in the Department of Agriculture and it is nice to say "How-do-you-do," at this time.

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(Songs by the Lions' Club Quartet.)

ADDRESS BY DR. E. J. KRAUS, UNIVERSITY OF CHICAGO

Mr. Toast Master, colleagues, I hope you are. I have been asked what is the title of this address that I am going to give you. I can hardly say that it is going to be an address. I have been trying to think all afternoon just what it is going to be. I am not yet sure. All I can say is that I am going to try to speak about a subject which interests me far more than any other that has ever come before me, and that is the subject of Growth Substances.

You people don't know what you have touched on, in listening to you this morning in your discussions about 2,4-D. You don't realize that you have taken one of the livest bears by the tail, that any of you have yet grasped.

You will find it out before you finish. What I mean to say is simply, I don't feel that I should entitle my talk. I would like to make it something snappy, maybe I can think of something snappy before I get through. I remember the first talk I gave on these growth substances sometime ago. The program had something like this--"The Latest Information on Growth Substances, with respect to their Psychological, Physiological and Botanical Details." At this conference, there were a number of County Agents, and you know what they say, so I found myself entirely out of the run. This time, I guess the title will be "Weeds--If So, Why?" I can only talk to you, I think, on the basis of my own personal interests. I can't tell you how to control weeds, I suppose that many of you could tell me many things about that. All that I want to say again, is that when you take hold of these growth-regulating substances, you have indeed taken hold of the livest bear that botanists, horticulturists, or any plant science harbors. And why? In my estimation, and I am going

to prophesy, I am old enough so that I can, it doesn't matter if it doesn't come true--if it doesn't come true, what's the difference? If it does, I'll be considered wise. My prediction is simply this. On the basis of ten years of experience in working with these substances, my feeling is that there is not a single thing that deals with living plants, that is not eventually going to find a part of its solution through the application of growth-regulating substances. It may not be 2,4-D. It may not be a whole string of "D's." It may begin and end with "D". All I know is this. When I began this work, some ten years ago, it was fun--a purely academic exercise. I am sure, if there are any here that know me, really, you will say, "Sez you!?" "You never had an academic thought in your head." You are probably right! But a lot of you don't know me, so I will try to get by for a little while.

I was interested in what plant cells do when they are subjected to certain of these growth-regulating compounds. In the beginning we had very few of them. One of the first ones was dichlorophenoxyacetic acid. It was a pleasure to be able to look down through a microscope and see it perform on plant cells. Out of that, have grown such things as the destruction of weeds, the holding of apples on trees longer than they would ordinarily stay on, the ripening of fruits, and I don't know what yet is to come. That is a very short list, indeed, of the things that can be controlled by these growth-regulating substances. We are going to make plants grow taller, if you wish them taller, and shorter, if you want them shorter. We are going to have them grow thicker, if you want them thicker, and thinner, if you want them thinner. When I start prophesying, the sky is the limit.

How dare I say this? Because we already have them. It is no prophesy--it is merely telling you those things which are already done, or are "on ice," if I may say so. The time will not be long before many of them are known. Now, this morning when I listened to your talks on 2,4-D, I was interested. I hope you won't mind if I say that I was amused. It took me back to childhood days when I used to take and poke a stick in an ant hill. In other words, somebody has poked a 2,4-D stick in an ant hill and we have the running around, and the confusion of mind, etc., etc., exactly like that of an ant hill.

Now, ants are supposed to be extremely ambitious creatures, and those of you who are my colleagues are that sort of thing. You are not going to stop with the baffling things which you told one another this morning, or maybe that you didn't tell one another. It sounded from where I sat, as though you were trying to tell one another. There is a difference. In other words, what is going to be the answer? I suppose that this material has been before you for perhaps a couple of years. The ideas are not particularly new. The idea of whether you want to suppress the growth of plants, or whether you want to stimulate the growth of plants is not particularly new. One of the things it seems to me, that those of you who are going to continue this work, should be brought about, is a far greater refinement than has been brought about now. There is going to come order into your ant hill, and it may be that it is going to center around 2,4-D. If I may use a crude expression, all I can say is, "You ain't seen nothin' yet!" In other words, that is not the end. The question is raised, "Will there be others?" Gentlemen, I am not going to have so low a valuation of your mental capacity as to think that you even take that question seriously. I really don't! In my estimation, I consider the use of these growth-regulating substances in the field of Agriculture the full equivalent of nine applications of fertilizer elements to the soil. I don't know the exact number of years that it has been since we began to apply fertilizers to the soil, but I would know if I were lecturing to a class, and I was sure they didn't know. I would probably tell them, I am not sure but what some of you in the office know, and I am not going to risk a guess, but I know that it has been a good many years. Yet, if I go to soil meetings and sit in with soil scientists, which I do, one of the livest questions which I hear is "When and how much nitrogen should we apply, and to what?" "How much potash should we apply?" I read a whole number of volumes, and when I get through on the back page, not in so many words, is the question, "Is there such a balance?" Upon reading 120 pages, would somebody suppose there were such a balance? Now, therefore, if we do not solve all of our growth-regulating problems in ten years, don't be too disturbed. In other words, in my estimation, what we need, and what is essential, is the going back and the taking of this thing somewhat slowly, and perhaps somewhat ploddingly. I should like to say, what we need is more investigations, and fundamental research, but I have heard that phrase so much that I would like to touch it off with an atomic bomb. In other words, what we need is just good, plain digging in. And I think that everyone of us doesn't have to look to a botanist. You, yourself, if you are willing to dig in, can do the same thing.

Now, if there comes into my hands, a new compound, and many hundreds have come in the last hundred years, one of the things I like to do, or would think of doing,

is to test it out and see if I can get the response of a plant to it. We try to set up a definite set of conditions so that it is possible to judge as nearly as possible, an average response of the plants to this particular substance.

I know it may sound egotistical to you, but of those substances with which I have worked, if one were to give me a microscope, and tell me, "It is one of the substances, which is it?" I think it would not be difficult to do. Yet, I recently read in a so-called "respectable journal" which reviews botanical literature, that all of these things are nothing more than "wound phenomena". My dear friends, would you please tell me what a "wound phenomena" is? You can no more tell me than the author of the paper, but it sounds good and it sounds fundamental, but don't leave that out of your integration.

Now, I don't like to be facetious, or to slam anybody, but I do want to say that such rubbish has no place in my literature In other words, I think our literature should be based on observations and not on somebody like me trying to tell you what is what. In other words, I am willing to tell you, to the limit of my ability, those things which I have been through, but they do not, and cannot possibly answer all of the questions. In other words, I have not carried on experiments under all conditions. But if I can see, for example, that the application of a substance to a plant brings about a certain reaction, such botanical information as I have, I try to put to use. If I see, for example, that cells are prevented from coming to maturity, and that fact has some bearing on a problem, it as once suggests to me some use for that substance. I had a plant man, sometime ago, come to me and say, "It is just too good, that all of the problems relating to growth substances have been solved." I said, "Yes, it is very much too bad." A little later when this weed-killing thing came out and the statement was, "I thought your answer meant you had something up your sleeve." Well, no more up the sleeve than is now up the sleeve. If one could see (let me take one of the most recent things) it is not the weed killing--some of you know the thing called "apple scald." Apples in storage take on what we call "scald" and when they are brought out, there are huge, ugly patches on the skin. I have recently had the privilege of reading a paper where that can be controlled to a marked degree. What was the reason? A part of this scald is due to the death of the cell of the skin of the apple, and if we can keep those cells alive through the application of some of this material, it should, at least in part, prevent that scald. It was a hypothesis worked out fairly successfully. Now, the same argument can be brought with many other things. It seems to me, in this whole weed problem, if one really, firmly believes, although I am told that a scientist is not supposed to have any beliefs, yet I am one who believes, that if you continue to gather data, as you presented today, that we can then begin to subject that to analysis. I am one who believes that we solve most of our problems by analysis. If we can get data from various parts of the United States and those data are sufficiently and carefully collected, that we will know the acidity of the soil, the general growth status of the plants you are dealing with, and we can finally weld that into something more than the complex pattern which now confronts you.

One of the things most urgently needed, and I am hoping very soon that we can begin on it, is a chemical analysis of these plants to see what this response is, and what we mean by differences in response. You may say that that is getting so fine that none of us can understand it. I don't think so. I remember many years ago when I used to be an entamologist, I did systematic work. I had, as one of my good campanions, a man who dealt in the classification of flies. He said, we are going to take each and every fly and then we will write down everything we see about it, and then after we have done that, we will burn it and make a chemical analysis of it. After we have reduced it to ashes, we will have the scientific name and we will throw the ashes away and try another. I don't mean to say that we are going to have to go to any such lengths, at all, but the thing that confronts us is this--we have made examinations of stems, leaves, roots, and various other parts of plants so that we could see what is happening. Some of you say that the plants grow themselves to death. Some of you say one thing, and some of you say another. We should know what is happening on the inside of that plant. It is our business, on the technical side of this thing, to work with you, and may I even use the expression, to work for you, in trying to determine this. If you will give us, in return, some of your complex data and situations, so that it will propose problems for us to work. Enough people come and sit at the desk and waste enough hours. I am not inviting you to do that, but what I mean to say is if these problems exist, could you weld them into something in such a form that we can bring them to some kind of an analysis and it is my estimation that we should not stop to say that bindweed is sensitive, is not sensitive, or is partially sensitive. We should try to find the mechanism of sensitivity. That is a large order, and if you want to say, "That is not for me to do," I will agree that is for some of the rest of us to do. Plant scientists have lagged behind, and it is time that we quit lagging. Supposing this situation should come

out, that we find that a plant that is sensitive contains a certain material which renders itself sensitive. I would not hesitate to add that we could add to our growth substances something that we could render that plant sensitive.

Now, I don't want to talk too complexly. What I have to say to you, I am trying to say from the inside out. I have talked before women's garden clubs, and they seem to understand. I have tried to talk before botanists, and they seem to think they might understand. Yes, it was my privilege to talk before a large group of physical chemists, of all people for me to talk to--a group of atom bombists. I think you have heard about them in Chicago. These were the people that were interested in that sort of thing, and they were tremendously interested. After we got through, they said, "You have given us in these substances, a new key to the understanding of the fundamental process of photosynthesis." I think maybe these chemists thought they understood, but I am not sure that they did.

May I just include one more group--this time a group of one. Do I understand? I can answer that--I don't. I am trying to understand, and if this seems abstract to you, I can only say that it is an attempt at groping. We have been working. We have worked to the best of our ability, and we shall continue to work to the best of our ability, and that has yielded results, so we just can't quit working. If we have been able to bring about an increase in the yield of apples in two and three tons per acre, without loss of quality; if we are able to produce blueberries which are larger and seedless and if it is possible to set tomatoes that will be larger, and if we have a ripening process for fruits and can delay the sprouting of potatoes and fruit trees in the spring and if we can control weeds, we will have our results.

A few years ago, we tried out a number of these chemicals, and the idea at that time among many people is that these are growth stimulants, but that was negative data. All one had to do was to turn his spy glass the other way around. Now, the negative data have become the positive date, which you are all seeking, and with which you are all acquainted. If it is a question of controlling weeds, you are interested in depressing, perhaps to the point of killing.

Now, it was mentioned this afternoon, that many of these plants did not set seed. That is right. One of the first things that we found in connection with this was the theory that there was a tissue differential. In other words, the embryonic tissue is the most easily destroyed of all of the tissues. It is not difficult, therefore, to produce husks with no embryos in them. That is all a part-and-parcel of what we have known for a long time. Now, the same thing is true if we have plants which have a large amount of chlorine, which is one of the most sensitive parts of the plant. We can control that with a different substance, or a different concentration than where there is a small amount. Years ago, and I was glad to hear somebody say today that he found a differential between forest trees. I remember one time a man stopped in to the office and I said, "Won't it be nice when we can go out into the forest and eliminate the wild trees in your forest and save those which are the desirable species?" That day isn't so far off. That wasn't too many years ago. After all, ten years seems short. He said, "You wouldn't consider yourself a prophet, would you?" I said, "No, I would only consider myself among those who have seen these almost miraculous things." They are not miracles. They are becoming common place. They were miracles only when we didn't know such things existed, and so I say once more--I hope that what is going to come out of a group meeting, such as this, is that we will all join hands--those of you in the fields--those of you who manufacture--those of you who like to be in the field and get there when we can, and that by joining hands, we are going to accomplish more. It is going to be a costly process; it is not going to be more costly than what we have already put into the study of fertilizers, but the reward is going to be great, and there is going to be definite information.

I think, really, that is all that I have to say. I know this isn't much of a speech, but it is as sincere and direct as anything I can say. Why should I drag you through a literature that is existent. Whatever I might think of you, I still think you can read. Whether you do, or whether you can't, I still think you can. I am one, for instance, who believes in very few class lectures. I assume maybe even students can read. Sometimes I have that faith severely tested, but nevertheless, I think they can, and I think you can and I think, above all, you are willing to do a bit of thinking and a bit of compiling of your data, and not think that this is a simple, easy road.

I cannot understand a man who says that here, we have a weed killer, and then thinks he can spray weeds next to a pea patch, or a bean patch, and not do something to the beans and peas. It is just a little difficult for me to understand that, but for the moment that may be overlooked. I can assure you of one thing, the plants are not going to overlook it.

You also remarked that we should not throw over the fence, all of these ideas on chemical weed control. You seem to be enthusiastic about it now. How long that is going to last, I don't know. The reason I say that is because of the fact that I was once told that we will have nothing of chemical weed killers because we have spent fifteen years trying to get farmers to cultivate, and we are not going to unteach them now. If you have done wrong once, by all means, keep on doing wrong--don't let anybody defer you from getting a new idea into your head, please. Now, such a thing is hard for me to believe, but you hear it over and over again. In other words, this 2,4-D is but the beginning and, after all, we have many weeds to control. We have differentials to establish, and we have many, many more things in the offering. I am going to quit and say, as I began--I know of no single process of the living plants that cannot be brought eventually under absolute control, and that is what we call agricultural research.

I thank you.

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(Tuesday Evening Dinner Meeting adjourned at 9:05 P.M.)

WEDNESDAY MORNING SESSION

The Wednesday Morning Session was called to order at 9:05 A.M. November 28, 1945 in the Spanish Room of the Lowry Hotel, by the Chairman, Mr. T. L. Aamodt.

MR. AAMODT: There are not very many here, but we decided that if we are going to get through with the work by noon for the thirteen States and the Provinces, we had better get started. If we start early, maybe we can allow a little more than the allotted fifteen minutes each.

The program this morning calls for a report from each state and nine Canadian Provinces. Bear in mind, that this is the first move of the conference in the direction of bringing an understanding of your regulatory work in the various States and the Provinces.

When we commenced with our work with the Central Plant Board, which includes practically the same thirteen Central States, the first thing that we did was to set up a uniform quarantine committee and the first important thing was the uniform regulations committee. If I had time, I would show you the results of that committee. I think it would be very well that you men start out on your year in this organization and talk very plainly to one another. We don't hesitate down at the central plant board meetings to sit down and criticize, and the individual will be right there. You can speak frankly as to laws of other states, as well as your own. Now, I am going to change the order of these reports a little bit. Mr. Schrader, I believe has a radio talk on schedule this morning, and if he is here, I would be glad to call on him first so that he can give his report.

WEED ACTIVITIES IN MINNESOTA, C. H. SCHRADER

Mr. Chairman. We have prepared a little report here concerning our activities in the State, and we are going to file this so that this becomes a part of the proceedings. I understand each of the States represented will do likewise. I think this is very important, because if they are filed, as has been indicated, there is some move in the direction of setting up more uniform State Laws so that they can be more effectively administrated. I think that would be to the mutual benefit of all of us, if we can have this at our finger tips, as to just what programs are put into effect in the several states.

In Minnesota, we have been struggling along for a good many years, wondering how to get the job done in the best manner. Going back a good many years, we can go back to civil war days when the first weed laws were enacted, but they have not been too effective, so it has taken a good many years to get a good active program under way.

As one man said, "You can't argue with the weed, you have to kill him." When we have the weed, we have to find out how to kill it, and that is up to the research people and extension people who are cooperating with us to get the job done.

Number one, several changes were made in our noxious weed list--eleven weeds were added to the list (Section 20.01, Sub-division 5).

One thing has bothered us a little bit when we get down to other states and start talking about weeds. Here, in this State, our public enemy No. 1 is creeping Jennie, or Convolvulus arvensis. But it seems more appropriate to call it field bindweed, so that we are in line with the name of the plant in other states. That is one move in the direction of getting uniformity. It has been known here as creeping Jenny, but we have used the term field bindweed to get the farmer acquainted with the best terminology.

Next, the last Legislature passed a law that all combines, seed hullers, hay balers, and other equipment used in harvesting of crops be added with threshing machines, and required to be posted with cleaning notices. (Section 20.10).

Next, for over twenty years, the Minnesota Weed Law has delegated the chairman of the township board as the official weed inspector of that part of the government. It didn't work as well as it might seem. The township chairman was held responsible, but each year we have had a tremendous turnover in new chairman of township boards and it meant that they had to learn their job all over again. This year, this past session of the Legislature saw fit to make the entire township board responsible--not only the chairman, but the supervisors, as well, so that eliminated somewhat the possibility of passing the buck, so to speak. Calling on your neighbors and asking them to take care of an infestation of primary noxious weeds is not very pleasant, but the township boards are finding out now that they are going to have more friends by putting over a good, sound, sane, weed control program than by staying away from it. So the law has now been passed, making it compulsary for the entire board to act, or if they so desire, employ somebody to do the work for them.

For a great many years, since 1921, when the law was written, it was possible for the County Board to employ a County Weed Supervisor to assist the Township Chairmen. The law said, in brief, that the county board may appoint a county weed inspector (one or more) to assist the township board to get a better job done. That was changed in the last session of the Legislature, and the law now says that the county board appoint not just a county weed inspector, but a county weed and seed inspector. As I said, you can't argue with weeds, you have to kill them, but I don't think it is necessary for us to plant them, but we are planting too many, and then trying to kill them later. These seed inspectors check not only the retail seed dealers to see that their retail seed meets the requirements of the Pure Seed Act, but the labeling requirements of the Pure Seed Act applies with equal force on all of our farmers within the State of Minnesota. All of them deal in seed, and a lot of them sell seeds to their neighbors. It is felt that they should meet the standard set up by the Pure Seed Act, in the same manner that our retail seed trade is required to do.

The township chairman of the town board now, as I said, is responsible. They are elected on a very democratic basis and we feel that they have the confidence of their neighbors when they take their Oath of Office, and they are expected to enforce the Weed Laws along with the other laws in their district. Many of them have complained, at least in those townships where they have taken the "bull by the horns" that the $75 which they were allowed to spend was not sufficient for them to go out and do a good job of enforcing the law. So the law was amended by the legislature so that they could spend more than $75, if they saw fit. We think that is going to be helpful. Now, the lid is off and it is up to that township to decide how much they are going to spend, not for weed eradication, but for supervision of their work within their respective townships. I am sure that is going to be very helpful. The salary is fixed by the town board and will be paid, the same as with similar other work in the Township.

We have classified our bad weeds in two particular groups--the primary noxious weeds and the noxious weeds. The five weeds that we have named as primary noxious weeds are really bad actors. The five are our creeping Jenny, or field bindweed, leafy spurge, horse nettle, Austrian field cress, and perennial pepper grass. We have at least 130,000 acres in this State infested with field bindweed, and we know that we have at least 100,000 acres of our best agricultural lands thoroughly infested with leafy spurge, and at one time or another it was making its appearance in our very best agricultural lands. We have struggled with Austrian field cress for fifteen or twenty years now in one particular community, and other places, also, and we haven't succeeded. We spent $75 an acre in a ten-acre field to bring this Austrian field cress under control by the use of sodium chlorate and borax, and I might say that we haven't gotten to first base. That was a year ago. Dr. Harvey applied hornome on that 10-acre field, and we didn't know yet how effective that is going to be. It did look rather promising.

That doesn't mean that we don't have other weeds that are more serious. Personally, we have literally thousands and thousands of acres, more or less, out of production because of Canada thistle. The same thing can be said of perennial sow thistle and many other weeds coming in which make operations in certain sections of the State very unprofitable. White mustard is getting to be a terrific problem in our seed production area.

Another stumbling block in our weed program is that when we serve these notices, and if the farmer doesn't comply with the legal notice given, he sits back and says, "My boys are in war, and I am too busy to get the job done--hire somebody to do it." It isn't very easy to go out and hire a neighbor to go on the neighbor's farm to kill or destroy a field infested with noxious weeds. So here, again, the law was amended, making it possible for the country board of commissioners to buy necessary equipment for use on private or public property to do the job, and to have the alternative of charging it against the land, and the expenses incurred will be paid along with their taxes, or they may assume the cost themselves, out of their own revenue funds. We think that is going to help materially in getting a better job done.

We had some personal things to deal with, as far as serving legal notices was concerned. It was necessary, according to law, to serve a notice if it was on non-resident land and waiting seven days before he could move in and take care of the weeds, providing they were not taken care of. If they posted their notices just before the Canada thistle started blowing, by the time the seven days was up, the damage was done. The law was amended again so that they can serve a notice in the local paper and this will constitute a legal notice. If the weeds are not promptly taken care of, they can move in and have the weeds destroyed, and charge it against the property, even though the land is non-resident.

I might stop here a moment to say, as far as we regulatory people are concerned, we have two kinds of land in the State of Minnesota--either resident land or non-resident land. Resident land is being owned or operated or used by someone residing within the county. If there is a property which has no agent or owner or operator within the borders of that County, then it becomes non-resident land and it is this land that is giving us a great deal of difficulty.

As an extra precaution, if the town boards feel, after serving notices that they want to take a little extra precaution they may still serve this written notice, and then go ahead and incur the necessary expense and charge it with the taxes.

That, in brief covers the changes in our weed law, and I am filing the complete list of 1945 Changes in the Minnesota Weed Law with the secretary so that it will become the property of the conference.

Thank you.

1945 Changes in Minnesota Weed Laws

1. Several changes made in our noxious weed list--weeds were added to the list. (Section 20.01, Subdivision 5)

2. The more generally used name, field bindweed was substituted and made legal for the confusing and more local name of creeping Jennie for Convolvulus arvensis.

3. Combines, seed hullers, hay balers and other equipment used in harvesting of crops were added with threshing machines and required to be posted with cleaning notices. (Section 20.10)

4. Counties now required instead of permitted to appoint county weed inspector when requested by commissioner of agriculture, who shall prescribe the qualifications of appointee--county to determine the term of employment. (Section 20.11, Subdivision 1).

5. Title of county weed inspector has been changed to county weed and seed inspector, with the expectation that they will also inspect seed during the inactive weed season (Section 20.11, Subdivision 1)

6. Heretofore, chairman of town board has been the township local weed inspector, or he could appoint an assistant to do the work--now all three members of the town board are local weed inspectors, or the board may appoint an assistant weed inspector to do the work. (Section 20.11 Subdivision 2).

7. Townships have been limited to $75 a year for weed inspection, which was not enough in many townships. This was changed so towns now fix the salary and the expense allowance of weed inspectors, (Section 20.11 Subdivision 3)

8. Materials infested with five primary noxious weeds (leafy spurge, horse nettle, Austrian field cress, creeping Jenny and perennial pepper grass, may be transported only under permits issued by county weed inspectors. (Section 20.12, Subdivision 2.)

   Such materials may be transported upon any public highway, only when in sacks, boxes, or other tight containers, or covered with canvas to prevent scattering of weed seeds along highway. (Section 20.12 Subdivision 2)

9. Board of county commissioners, and towns and municpalities by vote of their electors, or governing boards, may provide necessary funds for weed control, equipment, materials, and labor for use on public or private property, with, or without reimbursement from the property benefitted. (Section 20.12, subdivision 3.)

10. Method of serving notices was also changed. The posting on the land, publishing in local paper, and mailing of a notice required for non-residents has been amended to provide that service of weed notices on persons living temporarily or permanently outside of the local weed inspectors jurisdiction may be made by registered mail to the last known address of such person. (Section 20.15, subdivision 2.) Two kinds of notices are now provided. (Section 20.15 Subdivision 1).

    A. General published notices in legal local newspapers on or before June 15 and at such other times as commissioner of agriculture or local weed inspector may determine for special weeds and special occasions.

    B. Individual notices may be served at anytime on any number of persons. Such individual notices may contain definite systems of tillage, cropping, management, and use of livestock (Section 20.15, Subdivision 2.)

       It was intended that published notices should be authority for weed inspector to enter the land, destroy the weeds, and charge cost against the land with taxes. Unfortunately, the requirement that a written notice with a 10-day limit be required, which had been deleted from the amendment, was put back in so while published notices are legal, written individual notices must be given before expense is put against land.

11. Section 20.16 which provided that weed law should not apply to unoccupied platted lands, less than 1 acre in area, more than 1/2 mile inside limits of cities of 300,000 or more inhabitants was repealed.

12. Eight district state weed and seed inspectors now.

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MR. AAMODT: Thank you, Mr. Schrader. I think possibly within a year or two, you might want to frame the model weed law.

Next, is the Report from Kansas, by Mr. J. L. Hutchison, Assistant State Weed Supervisor.

WEED ACTIVITIES IN KANSAS, J. L. HUTCHISON

Gentlemen. Since there was a complete report given on the Kansas operation up to, and including last year, this report will consist only of the legislative changes made in our original 1937 Noxious Weed Law as adopted by the 1945 Legislature. We have felt that until we secured the changes need to control spread, our law was only half a law, as it dealt only with the eradication phase. The changes added to our weed law have given us the power and authority to conduct a program designed to exercise some control over various means of spreading seeds of noxious weeds. We feel that prevention of new infestations is as important as eradication of old, or existing infestations, and perhaps more so.

Our previous program, following the original enactment of the 1937 Weed Law, started out as a one-weed law, as it applied only to field bindweed, which is by many odds the state's most dangerous weed. This one weed law greatly simplified our work in setting up machinery for eradication. The 1945 Legislature added two new weeds - Russian knapweed (Centaurea picris) and hoary cress (Lepidium draba). These

weeds are important, but not widely spread in our state. The revised law also provides that Johnson grass (Sorghum halepense) may also be included as a noxious weed in those counties in which the county commissioners, by resolution, so declare. It has not given the board of county commissioners power to revoke this resolution when once declared. Another important change in our original law is that the law now compels boards of county commissioners to hire a county weed supervisor. Previously, the law stated that they may employ a weed supervisor. That change made but very little practical difference in our program because all counties, with the exception of a few were already employing supervisors.

In the original law, responsibility for carrying out enforcement of violations was placed upon the board of county commissioners. Our last Legislature made it mandatory that the county weed supervisor must investigate or aid in the investigation and prosecution of any violation of this law and report violations of which he has knowledge to the county attorney. In other words, the enforcement of our weed law operates in the same channels as the enforcement of any other law that we have. The Legislature also requires counties, cities, and townships to make such reports on forms provided as the Secretary of the Board of Agriculture, or his authorized representative may require. This does not materially change the program, except that we can now secure reports from those that did not previously make a report to our office.

The original law provided that in cases of enforcement, a legal notice must be given prior to May 1. That has been changed so that a legal notice may be given at any time during the year, and after fifteen (15) days from date specified in said notice, the authorities may enter or cause to be entered upon his, or their property and apply treatment for eradication of noxious weeds.

In discussing the new provisions that have been added to our original law, the Legislature made it possible for county, township, or city officials to cooperate in the eradication of any weed, if they so desire. This involves a different problem in our program, mainly to prevent officials from cooperating with individuals in treating common annual weeds.

A new section of the law provides that it shall be unlawful for any person, company, or corporation to offer for sale, barter, or give away, or otherwise dispose of screening or offal material, containing seeds of field bindweed, Russian knapweed, hoary cress, and Johnson grass, without proper processing, to destroy the viability of these weed seeds. It also provides that screenings or offal material may be sold to commercial processors or commercial feed mixers for processing. While we have had only a very short time to set up a program to make these amendments operative, yet we feel that we have made a lot of progress because a considerable number of dealers have installed machinery for the purpose of processing these materials. Others have used different methods of destroying these materials where formerly they were generally sold for poultry feed.

Another section makes it unlawful for any person, company, or corporation, to sell, barter, or give away nursery stock, plants, packing material, animal fertilizer, and soil or sod for landscaping or fertilizer uses which contains or is infested with noxious weed plant material or seeds.

This section is especially designed to help prevent the starting of new infestations, especially in our cities, which we were unable to deal with before. This, as well as some other sections, does not handle our situation as well as we would like, due to the fact, that so much infested material is bought by radio or by mail from outside our state, and shipped direct to the individual. It seems to us that we are sorely in need of a Federal Act that would require inspection of any nursery stock or livestock feed material at the point of shipment to see that it complies with the laws of the state in which it will reach its destination. We feel that all states should unite in a common effort to secure this enactment.

It is a well known fact that farm equipment is frequently responsible for spreading seeds or noxious weeds. Therefore, a new section provides in part; "That any person, company, or corporation shall not bring (1) any harvesting or threshing machinery, portable feed grinders, portable seed cleaners, or field ensilage cutters into the state without first cleaning such equipment free from noxious weed seeds or (2) to move away any of the above-named equipment from any field or farm infested with any noxious weed without first cleaning such equipment free from noxious weed seeds." It also provides that where a person is doing work for another, each machine shall be labeled. These labels are furnished by the State Board of Agriculture and must contain this section of the law. We are carrying out the provisions of this section by

requiring our county weed supervisors to inspect and label transient and local custom operators within their county. It is our hope to set up a program whereby we will have a temporary inspector of each State Port of Entry for the time that our transient operators are coming into the state to aid the county weed supervisors in carrying out their duties.

Since the sale and exchange of infested livestock feed materials is responsible for starting many new infestations, it was decided to include a new section that would make it unlawful for any person, company, or corporation to sell or offer for sale, barter, or give away any livestock feed material which is infested with seeds of noxious weeds unless such feed material shall first have been processed and the viability of all noxious weed seeds present therein destroyed, except such feeds (1) may be sold for consumption on the same farm where grown or (2) may be sold to commercial processors or commercial feed mixers.

Due to a very short oats crop this year, a large amount of infested oats has been coming into our state from states farther north. County weed supervisors were on the job and caught a large number of these infested cars, thus forcing the dealer to either process these oats to destroy the noxious weed seeds therein, or in some cases, the oats were shipped back to the commission company, costing one dealer over $400 in freight. In another case, the freight was stood half by the dealer and half by the commission company.

This condition brought about a request from the Kansas City grain exchange that the State Board of Agriculture and the Board of Trade work out a plan whereby these oats could be inspected for seeds of noxious weeds before being shipped into the state. The plan set up was one agreed upon by the Board of Trade, the State Grain Inspection Department, and the State Board of Agriculture. The State Board of Agriculture deputized each of the State Grain Inspectors at Kansas City as deputy inspectors for our department. These inspectors sample and inspect Kansas-bound cars for noxious weed seeds and give a certificate of clearance to go with the bill of lading, if the inspection shows freedom from seeds of noxious weeds. This certificate of clearance is recognized by each county weed supervisor as official so that there would be no further necessity for inspection on that carload of feed material. This service is available to all truck and carlot shippers for a small fee. This plan has been very successful. In the first eight weeks, out of 240 cars inspected, eighty cars were found to be infested and were shipped to other states. This is unfortunate for the other states, but very fortunate for Kansas. Since our State is spending large sums of tax money for the eradication of weeds, we deem it expedient to protect ourselves against infested materials being shipped in, and thereby cancelling the gains we have worked so hard to make. We have a similar set-up in St. Joseph, Missouri, and Omaha, Nebraska. This plan is also in operation at all of our twelve state branch grain inspection laboratories where complete inspection service is maintained. With this plan aiding the county weed supervisor in checking infested grain within his county, we feel that we can control to a fair degree the spreading of noxious weeds to uninfested lands.

In setting up the machinery necessary for carrying out the new sections of the law, we first held a series of six district meetings for the county weed supervisors, county commissioners, and county agents to explain the changes in the law and advise them on the necessary equipment required and where it may be purchased. In these meetings, the commissioners and weed supervisors felt that they should have a meeting in each of the counties for dealers and nurserymen and that a representative from the state office should conduct these meetings and explain to them the changes and the requirements of the law. In compliance with this request, we scheduled a meeting in every county in the state for the dealers in that county. Later on we found that some of our weed supervisors did not do a good job of identifying our noxious weed seeds from other similar weed seeds. We had a case of one supervisor turning down a carload of oats that later proved to be nothing but wild buckwheat. Another had let two carloads slip by that had bindweed in them, because he was unable to identify bindweed seed and in a third case, the weed supervisor did not think that there was any oats being shipped into his county; later proof showed that several cars had already arrived in his county and were sold without inspection.

It then became necessary that we must hold another series of meetings in order to educate and school these men in identification of weed seeds. This was carried out in nine district meetings in various parts of the state. Before we had completed holding these meetings, one county had already had a prosecution and conviction. Fortunately, we had a top weed supervisor in that county who had already inspected and made his report on twenty-six cars of feeding oats that had been shipped into the county. This dealer was fined $100 and court costs for selling infested feed grain contrary to the new provisions of our law.

It might be of interest to some that our county weed supervisors have been equipped and trained on a simplified system of making determinations for the presence of bindweed seeds in samples of oats or barley by the use of 1/12 and 8/64 inch round hole dockage sieves. The use of these sieves will reduce the sample to be examined in about the proportion of 40 or 50 to one.

We feel that this system is probably 99 percent as reliable and dependable as standard methods and technique used in state seed laboratories and is from five to ten times more speedy. This system also has the advantage of being able to conveniently handle larger samples with very little extra time, as well as being able to make quick determinations on the spot for dealers or others and at the same time relieving the state seed laboratory of the extra work.

Our revised law further provides that it shall be unlawful to feed to livestock any infested feed materials without first processing to destroy viability of noxious weed seeds, except on the place where grown or when purchased from a grower or dealer within the state. The reason that the feeder is not made responsible when the feed material is purchased from a grower or dealer within the state is because the preceding section makes it unlawful for the dealer or grower to sell it without first processing. This would seem a little confusing, but it prevents feeders from crossing the state line and buying infested material and bringing it into the state and feeding it without first processing. It also prevents an individual from moving infested feed material from the place where grown to be fed on uninfested land.

The law gives the proper officials the right to enter upon premises and inspect property in connection with the administration of the state weed law. We feel that a large number of the handicaps have now been removed and that should give us a more efficient weed program in Kansas.

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MR. AAMODT: One little thought that I might inject is that laws are really no good unless we have two things come along with them--adequate appropriations and the fortitude to enforce the laws within the state. I can't help but mention that after John got through, because last summer while on a tour in Kansas, I happened to talk to one of his township supervisors and he said he made five arrests that season in that ownship.

I will now call on Mr. Keltner of Illinois. (Mr. Keltner was not in at the time).

Then, we will call on Mr. Lee of Indiana.

WEED ACTIVITIES IN INDIANA, MR. LEE

It will not take me very long, as we do not have an active weed law in the state. We are, however, making a little progress. The last Legislature made it possible for the appointment of a commission in the State to study the problems and to recommend a bill which might be appropriate for that type of work in Indiana. That commission has been appointed, and they are hard at work at the present time. We, are trying to make a survey of the states to determine just what the problems are, and we are trying to contact the farmers of the state to learn what they would like to have. Then we hope to take advantage of the epxeriences on laws that you gentlemen have had in effect for so many years, and if we can get together some of your experiences, perhaps we can get a law into effect that will be effective and help us on our program.

The need in Indiana, as I see it, is a well-balanced weed control program. Such a program should include experimentation, educational or extension teaching and the enactment and enforcement of adequate weed control laws.

During the past year, a rather extensive experimental program has been under way with new and promising chemicals. It looks as if at least some of this work will bear fruit. Several formulations of 2,4-D materials look promising as herbicides. These materials, and others that may be developed in the future, certainly will make it possible to apply chemical weed control under conditions where it has been impractical before. I am thinking, mainly, of the eradication of weeds in lawns, pastures, grain fields, cemeteries, along roadsides, in grass seed fields, and other grass lands where selective materials are necessary to kill the weed and save the grass or crop.

I realize that the subject of chemicals has been discussed to quite a length, but just to show the possibilities, in this case, I cannot refrain from mentioning one experiment conducted in Indiana this past summer -- in brief--a patch of bindweed in an oats field was sprayed with 2,4-D. At the time of treatment, the oat plants were about eight inches tall. Yields were obtained on sprayed plots and on checks both with and without bindweed on them.

The results were as follows:

Yields on check plots, not infested with Bindweed	64.7 bu.
Yields on check plots infested with Bindweed	22.4 bu.
Yields on plots sprayed with 1000 ppm 2,4-D 1½ gal. per sq. rod	66.0 bu.
Yields on plots sprayed with 1000 ppm 2,4-D 2¼ gal. per sq. rod	56.1 bu.

New growth of bindweed appeared after oat harvest and retreatment may be necessary to complete the job of eradication. But the fact remains that the weeds were destroyed for a time sufficient to increase the yield of oats from 22.4 bushels to 66 bushels per acre. Other experiments indicate that the same can be done in corn fields. If these results are verified by further experimentation, chemicals will have found a new place in the weed control program.

Our job in the field of extension teaching is to assist farmers, home, and land owners, to reduce the losses caused by weeds. They should be supplied with the latest information on methods of eradication, distribution and habits of weeds. Another important job is to prevent the introduction of weed seeds through impure crop seeds and feed. Much of this work is done by, and in cooperation with, the State Chemist, who is charged with the enforcement of the State Seed Law. Meetings, demonstrations, and exhibits and publicity play a part in the educational program. Indiana is fortunate to have a county agent in every county of the state. All county agricultural educational programs center around the county agent.

When research gives birth to a new development or idea in weed control, it is the job of the educational and extension forces to not only demonstrate the merit of the method, but to take all the necessary steps to assure its use. It may be necessary to assist in establishing distributing agencies (in the case of materials) to arrange for and demonstrate equipment. For instance, should these new chemicals do what we hope they will the next big job is to bring about their use. And in order to secure the best results with these materials, in the hands of farmers and home owners, an extensive educational program is necessary. Those of us who are not fortunate enough to have available county equipment and county weed supervisors must depend on volunteer leadership and assistance to achieve results. In addition to working with adults, a program to create interest in weed control among boys and girls is desirable. They are the future farmers and leaders. Before the war we started a weed demonstration team contest. It was discontinued during the war, but it is now revived and revised. It is promoted by the wholesale seedsmen of the state. They furnish the money for awards. Any 4-H club or vocational agricultural class may enter a demonstration team in the county contest. The top two placing teams in each county will compete in a district contest. Before entering the county contest all teams are required to demonstrate before a farm meeting. This not only gives the teams experience, but acts as an educational meeting for farmers of the community.

I hope that other states will become interested in demonstrations of this nature so that a national contest can be set up.

Indiana has not progressed as fast as some states in regulatory work on weed control. We do not have a new weed law. The laws on the books at present are not very effective and seldom enforced. We have, however, made some progress along this line. The last general assembly passed a resolution requesting the appointment of a weed control study commission. The commission has been appointed by the Governor and is making a study of the problems and laws that might be suitable. A series of meetings are planned in areas where Johnson grass, bindweed, Canadian thistle, quack grass, perennial sow thistle, and other weeds are common to obtain the reaction of land-owners on various types of laws that might be helpful in solving the weed problem. Should these meetings and surveys show the desire, on the part of the farmers and land-owners, for the enactment of a weed control law, a bill will be written and presented for passage. There is a good possibility that suitable legislation relative to weeds will be enacted in the near future and with the research and educational program make a well-balanced program.

Those in charge of seed law enforcement have always cooperated on the educational program on weed control and seed. Mr. Carter, Assistant State Chemist and Seed In-

spector is with us. I think he has a few remarks to make regarding the work of his office -- Mr. Carter.

SEED CONTROL PROGRAM IN INDIANA, A. S. CARTER

The seed control work in Indiana is centered in the Agricultural Chemistry Department, Purdue Agricultural Experiment Station. The head of the Department of Agricultural Chemistry, the State Chemist, and the State Seed Commissioner is one person--namely, F. W. Quackenbush. Four laws are administered by this department, the seed law, the feed law, the fertilizer law, and the inoculant law.

Since this work is located on the Purdue campus and is a definite part of the University, we are able to cooperate with other experiment station workers and extension specialists on problems of mutual interest. For example, we have cooperated with Mr. Lee of the Botany Department and in holding many series of meetings on the general subject of weeds and seeds. Often a representative of the Agronomy department has helped with this type meeting by discussing crop varieties.

This type of organization has resulted in close cooperation among the various departments in carrying on worthwhile work. We feel that it is an ideal arrangement.

The Indiana Seed Law, which was originally enacted in 1921 was amended in 1941 to comply with the provisions of the Uniform State Seed Law proposed by the Association of Official Seed Analysis.

Under this amended law, the noxious weed seeds are divided into primary and secondary groups with six weeds classified as primary noxious weed seeds and fourteen as secondary noxious weed seeds. Sale of seed containing any primary noxious weed seeds is prohibited. No tolerance is provided in the law for primary noxious weed seeds, since we find that where tolerances are provided, additional tolerances are added to the tolerances in the law and the result is too many primary noxious weed seeds.

The law prohibits the sale for seeding purposes of any agricultural seed that contains more than 1/2 of 1% by weight of secondary noxious weed seeds and more than 3 percent of all weed seeds.

Farmers are exempt from labeling seeds under certain conditions but are not exempt from the weed seed prohibitions. These apply to all seed sold by anyone for seeding purposes.

Since this is the case, we feel that some check for compliance should be made and for the past several years, have carried out extensive surveys among farmers. We approach this problem by hiring additional inspectors during the seed seasons, whose principal duty is to call on farmers and sample seed that they have purchased from any source. By calling on several hundred farmers each year and sampling all the lots of seed, they have purchased, we feel that we are letting a lot of people know that the seed law is being enforced.

Funds must be available if seed control is to be done thoroughly. The various States get these funds in various ways, many of them in insufficient amounts. Indiana operates on the official tag system, and we like it because;

1. It raises sufficient funds for thorough control.
2. Seedsmen pay inspection fees in proportion to the amount of seed they sell, and,
3. It makes everyone "label conscious." After all, the label is the basis of seed law enforcement.

We note the interest of this group in the dissemination of weed seeds through the distribution of commodities, such as commercial feeding stuffs and feed grains. Since our department enforces the feed law in the State, we have been able to study this problem to a limited extent. We have found that dairy feeds are the worst offenders, as far as the dissemination of viable weed seeds are concerned .

One of the big seed processors in Indiana has told us on several occasions of shipping straight cars of dodder seed to feed mixers for use in dairy feeds. We have found viable bindweed seeds in dairy feeds sampled in Indiana.

We sampled nine carloads of feeding oats last year and analyzed them completely. Primary noxious weed seeds were found in four samples out of the nine and secondary noxious weed seeds were found in all of the samples.

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MR. AAMODT: Next, I will call on Mr. Sylwester of Iowa.

WEED ACTIVITIES IN IOWA, E. P. SYLWESTER

Mr. Chairman. We feel that the Iowa report that was made last year, and which is a part of the Proceedings of last year is still as it stands, and perhaps there is not much need of repeating the distinctive set-up under which we operate in Iowa. That was quite thoroughly given at the last conference. Our work in Iowa is primarily divided into three portions--the educational phase, which is centered in the Extension Service, the Research work, which is carried on at the State College, under the experimental station and federal set-up, and the enforcement work, which is carried on very ably by our Secretary of Agriculture, and his assistant.

I think perhaps I will confine my remarks to some very brief statements as to the work which we have done in Iowa during the past year, and I do want to share my time also with Dr. Bakke, who heads our Research work, and Mr. Spry, our Assistant Secretary of Agriculture, who works in enforcement work.

I might just as well be frank about it--our program in weed control has suffered very seriously in the last few years. It is nobodys fault in reality, but we have all been through a very strenuous period. The specialist, who is normally assigned to work in weed control was drafted, and so the work in weed control was slighted to some extent.

We started to make repairs in that direction, and have secured the services of an additional specialist to take over the work in plant pathology again, and so it will be possible to resume full-time work, as far as work concerning weed control.

The other unfortunate thing that has happened is that we spent a good many years educating our extension directors in the weed problem and many of them have gone into the service. Many will be back, and some of our county extension directors in Iowa have taken other jobs and it has been very disheartening to expend a lot of time getting the county agents enthused to carry on a good educational program in their counties, and then have them taken out of their work. The enforcement angle has suffered under the same handicap. Last year we had requests from 40 counties for a weed control program in their work for the year. We held meetings in all of those counties with the county supervisors. In all, there were 89 meetings, attended by approximately 5,000 key people, and supplemented that by six radio talks, 22 demonstrations, which were put on throughout the state demonstrating the techniques for sodium chlorate, and the interest was always extremely high in the 2,4-D compounds. Sometimes it was quite embarassing because we couldn't give them much information on such things as livestock poisoning, so we told them to keep the animals out of the areas. About all we could say was, "Here is the plot, you watch it!" The plots were labeled along roadsides and pastures so that farmers could observe them throughout the entire season. We supplemented the radio talks by a series of press articles by all the major newspapers in the State. We supplemented that by our two bulletins. Most of you are acquainted with them. Our state department bulletin confines itself entirely to the primary and secondary weeds, and our college bulletin to the tune of 20,000 copies, and we are asking for a reprint.

There is a tremendous interest in weed control. We have an expression in Iowa that these are sent out on force draft to everybody, so it was sent out only in response to request.

As far as looking forward to next year, we have unfortunately requests from 68 counties that want meetings on Weed Control, and the unfortunate part is that they all want them in June. Somebody is going to be busy in June. If we can weather it this year, maybe times will be better a little later on.

Now I want to call on Dr. Bakke for a report on some of the things he has done last year.

WEED ACTIVITIES IN IOWA, DR. BAKKE

Mr. Chairman, in listening to our Research Program yesterday, may be some of you got an idea that we were all playing around with 2,4-D and spending all of our time on that project. In Iowa, the research program is centered, more or less, at our Cherokee Station, at the State Grounds of the State Hospital in the Northwestern part of the State, and last year we had another area in the Northern part of the State at Crystal Lake, which is one of the centers for truck crop production.

At the Cherokee Laboratory we have given considerable time to 2,4-D compounds upon our good friend, creeping Jenny. (We still call it that.) At Cherokee we had something like 80 acres solid to work on, so there was plenty of material. We also did some work, since 1942, with borax using borax as a chemical to eradicate bindweed, and along with that, we have been working with the use of certain injection compounds. In the fall of the year, they inject the soil with toxic compounds, tetrachlorethane, and they use a special injector at eighteen inches apart and at a width of from twelve inches apart with smaller amounts. We use two ounces, generally. We have been able to eradicate the creeping Jenny, or the bindweed. The method, of course, is laborious, but that is one way of getting rid of this pest. We have found, too, that the toxicity from the injection remains through only part of the following year, so that we can grow an average crop of corn the next season.

For several years, we have been engaged in growing soya beans on large areas of creeping Jenny. We find that we can grow soya beans on heavy-infested grounds for a period of three to five or six years and we find that we have been able to eradicate. The system is one of starvation. Along with the observations, we have been making chemical analysis of the roots to determine, not only the amount of root material left from year to year, but also the kind of carbohydrates present and the percentage of food materials present in the soil. So much, then, for our Cherokee work.

At Crystal Lake, we have a good deal of beets. We grow vegetables like onions, carrots, and crops of that kind. In the case of onions, we have tried out these 2,4-D compounds, and find that they are not so hot there. In the case of growing carrots, we have been very successful in treating carrots with furnace oil in one application. We are able to eliminate that first weeding process so that it cuts down on the cost of the production of the crop.

We also have several cooperative experts in our Agricultural Engineers, and they have helped us in the matter of designing special types of rotary cultivators, and an experimental sprayor that does the work and doesn't cost very much.

In this area we have a very extensive ditch running through 3/4 of the section of land that we have. One of the problems has been to eliminate the Annual Weeds like ragweed and other weeds like the stinging nettle, etc. The stinging nettle is not an annual, but we have a spray that looks very good, and one of its virtues is that it is cheap. We took 15 lbs. of sodium chlorate and added three pounds of sodium pentachlorophenate per 100 gallons of water, and used it as a spray. We have gotten very good results in controlling those weeds. The spray, as I told you, is cheap. It is about $2 for the material for 100 gallons and we need about 100 gallons to the acre, when the weeds are eight to ten inches high. That, of course, not only eliminates the weeds, but also helps those people that are troubled with hay fever. If weeds are troubled, then they have no pollen to produce.

At Ames we made chemical analysis of the roots of the materials that have been sprayed, and also of the roots of these weeds that have been taken from our soya bean areas, and the weeds that have been sprayed with 2,4-D compounds. Last year, the campus was treated with Weedone, and the campus authorities bought fifty gallons of Weedone at $10 a gallon, and they got rid of most of their dandelions on the campus.

The general conclusion that can be derived from Mr. Sylwester's determinations is that at the early stages he gets better results than later on.

WEED ACTIVITIES IN IOWA, CLYDE SPRY, ASS'T. SEC. OF AGRIC., IOWA

Mr. Chairman, and gentlemen. Mr. Sylwester told you it is the job of the Department to more or less carry on the enforcement in cooperation with their county board of supervisors. Our attitude reminds me of the attitude of the negro, who was helping to shingle a church roof. During the season, for three or four months, we hear a lot about weed control, and along in the wintertime when we have a meeting of our State Legislature, they forget all about it. Anyway, this negro had just about arrived at the peak of the roof when he lost his hold and started sliding down the roof. He commenced hollering, "O Lord Save Me," and he got just about to the end and stopped and said, "You don't have to bother now, Lord, I is fastened on a nail." That is just the attitude we find over the years in the enforcement of our weed law.

The reports of the county weed commissioners through the county board of supervisors come to our office and we make the report to the Legislature. The annual work for the season just closing shows that less work has been done by them than at any time in the past ten years. Many counties failed to have any work done and a

few did not find anyone who would accept the job as county weed commissioner. The counties that have had weed commissioners for a number of years went ahead and these reports show considerable progress. They were handicapped by lack of spray material and other equipment.

The State Weed Council failed in its attempt to have some changes made in the weed law at the Legislative session this year.

The two points that were most important were (1) the change from township to county or district weed commissioners and (2) the right for county boards of supervisors to set up a tax levy to be known as the weed control fund. The Iowa Weed Law states that the county board of supervisors must notify a property owner to cut his weeds at a given time, and if this is not done, then the county can order them cut and charge the cost against the land in taxes. During the past few years, this has become not a penalty but a service to the property owner and to make matters worse, this season after the board had given notice to cut the weeds and it was done, the boards could not hire men under the county wage scale to get the job done. The result was that the department of agriculture and the attorney general's office were flooded with mail demanding that the county boards and weed commissioners be forced to do their duty. You must understand that our Iowa Weed Law has no penalty for a property owner for not cutting his weeds, but does have a penalty for the county boards and weed commissioners for not performing their duty.

This fact and many other causes of spreading of noxious weeds has caused our department to propose some suggested changes in our weed law, which relate to the control of seed and grain screenings, hay or straw containing weed seed, movement of machinery from farm to farm, destruction of weeds in growing crops, criminal code for control of noxious weeds on private land and railroad property, also a penalty for persons who neglect, fail or refuse to comply with the law when so ordered by a legal body. In order to assemble these needed changes, we have borrowed laws of adjoining states.

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MR. AAMODT: May we have the report from Illinois, Mr. Keltner, Superintendent of the Division of Plant Industry, State Department of Agriculture.

WEED ACTIVITIES IN ILLINOIS, CHAS. H. KELTNER

I believe that we are expected not to repeat any of the material given a year ago. I want to assure you, Mr. Chairman, that it will not take fifteen minutes for me to add to what was said last year.

The interest in weed control in Illinois has increased very rapidly during the past year. While I agree with the previous speaker, that this interest in weed control is naturally very seasonal, I have reason to believe that the season is going to be very much longer, especially in Illinois, in the furture than it has been in the past. Last year we had approximately 750 townships in the State with weed commissioners working in various degrees of intensity and activity.

From their reports, there was very much better work done, in spite of the shortage of chemicals and the shortage of gasoline and tire allotments, etc., which have come up. During the coming year we plan to personally contact, in the small group meetings, all of our noxious weed commissioners. A large portion of them are in the northern half of the State. It is our plan to hold small district meetings with these men in cooperation with the extension service of the University. I am sure that we can look forward to greater activity because of the fact that it is so apparent that there was greater demand for the work.

I think that I have nothing further to report, other than that we are delighted to know that Dr. Sherwood has been released from the armed forces of his country and is back to the University of Illinois, College of Agriculture, to give more attention to this work. He assures me that another member of his staff is expected to be released from the armed forces in February, and it is the intention of the authorities there that this gentleman devote his entire time to weed work. I am sure that the intensity of the work at the experimental Station and College of Agriculture is going to be stepped up substantially. We expect to give much more attention to it in the Department of Agriculture, so I think by another year we will have a progress in the work to report to you. Thank you.

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MR. AAMODT: Thank you Mr. Keltner. You certainly did well. Perhaps Dr. Sherwood has a word to say.

DR. SHERWOOD: I don't have anything to add, except that I am back on the job and anything that I would say would be repetition.

MR. AAMODT: Next we will have the Report from Michigan, Mr. Charles A. Stahl, Director of the Division of Seeds, State Department of Agriculture.

WEED ACTIVITIES IN MICHIGAN, CHAS. A. STAHL

Mr. Chairman, I thought I could really give you some cooperation in your time-saving efforts. I am compelled to report again this year, that our administrative weed program in Michigan is lagging, in spite of the fact that we have a comparitively new law. Our law was enacted in 1941, but at the time it was enacted, the labor situation got very bad and some of the Counties that expected to embark upon a weed program were unable to accomplish anything. The result is that there is nothing going on in the way of organized administrative weed programs in the State at the present time.

The weed project, though, is being considered, along with other post-war projects, and I have every reason to believe, from the sentiment found through our extension service that more will be done in the future. Apparently the sentiment is crystallyzing in favor of a better weed program. I don't mean to say that we are not interested in weeds in Michigan, because there is something being done. Our Agricultural Experiment Station is doing some very fine work along that line, and I came prepared to divide my time with Mr. Kingsley, who will give us a little on the work along that line.

MR. KINGSLEY: Until about two years ago, the weed research work in Michigan was more or less of a hit-and-miss affair. It was scattered among the different departments of the college, and no efforts in weed control measures were made or in weed control projects.

Two years ago there was quite a lot of interest in weed control from the various standpoints, and the director of our Experimental Station assigned me to devote a major portion of my time to weed control measures of one sort or another. At that particular time, the major demand for weed control work was in the field of vegetable crops. Many of our growers were not able to secure the proper amount of labor and their production cost was so high that their crops were being neglected because of the scarcity of labor. That is especially true in carrot and onion crops in the State. We have a lot of muck land and from the soil of that type, the labor costs are terriffic.

We set up a series of experiments to try to give some aid to our farmers that engaged in the production of these crops. Since that time, the work has been carried on and emphasized, in connection with these crops. In the carrot industry, we feel that we have that situation pretty well in hand now, by the use of several petroleum products--furnace oil we are not able to use successfully because under our conditions the oil is not dissipated very favorably and undesirable flavors might be produced. We use the Staddard Solvent and can eliminate 95 percent present in the early stages of the growth of carrots. That is, in terms of annuals--not perennials, which means that we can eliminate the first weeding and cut down the subsequent weedings to a low figure, and our production costs are now reasonable.

This same material proved successful in parsnips and in our celery plants. One of the major problems in celery is when in the seed beds. Those small plants are subject to competition with chickweed and many others. It is possible to completely eliminate hand weeding in the celery seed beds with the use of petroleum products. We have also done work in the onion groves using sulphuric acid and some work on the dinitro-compounds. The results there are not as striking as in the case of carrot weed control. We are having a fair measure of success with those products in onion production.

We have also done some work in the production of canning peas. The major work there is on mustard and Canada thistle. We have done work on that and a report is being prepared and will be available on the use of dinitros in the pea industry.

Next year, we are planning for the control of certain weeds in pastures and alfalfa plantings.

We have a weed that I have not heard mentioned, and that is the wild carrot. It is increasing in our pastures. We are trying to find some way of eliminating this weed and we have various experiments planned for next year.

One other phase of weed control that we like to mention is in connection with another industry. We have a problem in connection with the tourist trade. Many of our parks are very heavily infested with poison ivy. We have done some work in connection with that, and have gone back to 2,4-D with varying results. Sometimes we kill it, and sometimes we don't. We have carried on some work and attempted to eliminate poison ivy from these areas.

The largest weed problem is rag weed. Large areas of the State are heavily infested with rag weed, and an abundance of pollen, so we have been working trying to devise a method whereby we may cut down the heavy pollen production prevalent in the State. It is not necessarily desirable under our conditions to completely kill rag weed, but we have made an effort to prevent the formation of pollen and we think we are now underway where we can entirely eliminate the production of pollen and rag weed by use of the proper amounts of 2,4-D. It looks very promising and we hope we will be able to accomplish some good in that connection.

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MR. AAMODT: We have a new mike here, so you might be able to hear a little better.

The next report is the Report from Missouri by Mr. J. W Kuhler, from the State Department of Agriculture.

WEED ACTIVITIES IN MISSOURI, J. W. KUHLER

Mr. Chairman, ladies and gentlemen. It is not going to take me very long to tell you what we are doing in Missouri. We don't have an effective program at the present time. The weed control work has been carried on by the extension department and they haven't done so much for the past two years. We expect to begin work in the future. We have a very good seed law in Missouri, passed in 1939, but it is not as effective as some of the other states'.

The three prohibitive weeds are Johnson grass, bindweed and Canada thistle and quite a number of secondary-noxious weeds.

I don't know that I have much more to say, but I do want to say that we have enjoyed this meeting very much.

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MR. AAMODT: Thank you Mr. Kuhler. We will now hear the Report from Nebraska, Mr. W. L. Klatt, State Weed Supervisor.

(Mr. Klatt unable to be present, therefore Mr. Loys Smith, Assistant Chief, Noxious Weed Division, substitutes for him.)

WEED ACTIVITIES IN NEBRASKA, LOYS SMITH

I will give a brief outline of the weed work in our state, but first I want to discuss our weed law and a few of the major changes in the weed law, so those who were not in attendance at the conference in Omaha last year will have a better understanding of the Nebraska weed law and the Nebraska weed program.

As most of you know, our weed law is based on the organization of weed eradication districts. In the past, the organization of these districts has been somewhat of a bottle-neck to the weed program. However, last year, our legislators greatly streamlined the law, thus making it possible for 25 or more landowners in any proposed area to file a petition with the county clerk and cause a hearing by the county commissioners on the organization of a weed district. If the petition is approved by the county board upon the recommendation of the Department of Agriculture and Inspection, the organization is created.

Weed districts are legal sub-divisions of the state and are under the general supervision of the Department of Agriculture and Inspection, but are administered by a board of three to five supervisors elected from landowners at annual meetings of the district.

All landowners in the area are assessed for administration and operation of the district; an individual landowner is, however, responsible for, the cost of the work of control and eradication of noxious weeds. The district may impose an assessment of the land of any landowner failing to cooperate. Infestations on roads, railroad rights-of-way, drainage ditches, and canals, must be controlled and eradicated at the expense of the agencies concerned.

Further changes in the law make it possible for districts to employ field supervisors or other help and purchase equipment and supplies. They shall sell chemical materials to landowners at cost and may make such charge for the use of machines and operators to cover actual cost of operation. No financial assistance is given to landowners for eradication and control purposes by the district or the state.

At the present time, there are 47 districts in the state, 24 are established on a county-wide basis. The total area now under organization comprises over 10,000,000 acres. It appears that of the 93 counties in Nebraska, those having a noxious weed problem will be under organization and conducting an active weed program by the end of next year. The new law also provides "If a district has not been organized in a county by January 1, 1947, the county board shall at once organize a district where the director of the Department of Agriculture and Inspection shall advise that there is need for a district." At this time, however, no petition is necessary.

Bindweed is our major weed problem. Other weeds designated in the law are hoary cress, leafy spurge, Russian knapweed, Canada thistle, and puncture vine. Provisions are also made that the Director of Agriculture and Inspection may designate other weeds of a similar character as noxious if conditions justify.

While the weed law is administered by the Department of Agriculture and Inspection, the weed program, based on education, district organization and the prevention of new infestations is integrated and coordinated with the College of Agriculture. The state weed advisory committee created by law maintains close cooperation between the two institutions in administering and developing the weed program and in bringing about the cooperation of other agriculture agencies. The committee consists of the Director of Extension Service, the Chairman of the Department of Agronomy of the College of Agriculture, the President of the Crop Improvement Association, and the President of the Nebraska Horticultural Society.

Eradication work is progressing in Nebraska in both the organized and unorganized areas. This year, with the limited amount of chlorate chemicals available, over 2,000,000 pounds of chemicals were again supplied. The demand for chemicals far exceeded the supply.

We, in Nebraska, feel that chemicals and labor will be more plentiful next year and are looking forward to a most active program. I thank you.

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MR. AAMODT: Thank you very much. The next report is the report on North Dakota by Dr. R. C. Hastings, State Seed Dept.

WEED ACTIVITIES IN NORTH DAKOTA, R. C. HASTINGS

Gentlemen, I don't know just why I was asked to report on the North Dakota Weed Laws and the enforcement thereof. I suspect that our Weed Laws in North Dakota are a little disorganized and not under a single head or organization. That is probably the reason that they asked me to give them, because most of them are not under the Seed Department activity, and as far as I can learn, they are not really under one head. I think they are faulty in that connection.

I suspect that the laws in North Dakota were summarized before you people last year. I do not know, but I would be willing to go over them hastily, because I thank the next speaker will have something more fundamental and interesting.

We do have a fundamental or basic weed law in North Dakota, and from the remarks I have heard here this morning, I think that is quite similar to many of the other states. We have a list of weeds which are supposedly subject to compulsory elimination--leafy spurge, bindweed, Russian knapweed, sow thistle, etc. I suspect this law is somewhat old because I know there are some weeds that should be added and some removed. Each person in the State owning land must destroy noxious weeds, but in order to enforce that, no such duty devolves upon such person to destroy such

weeds until the county commissioners have prescribed the time and manner of destruction, which is in the form of a public notice ten days to two weeks in advance. Apparently, if he doesn't do it, nothing happens, excepting that the county commissioner can advise the overseer of highways to destroy them, and if he does, he can put his charges or claim of costs and if they are not paid by the owner of the land, they can secure a judgment and it becomes a lien on the land.

The laws also makes the overseer of highways, or those in charge of public lands, such as school lands and parks, responsible in keeping their right-of-ways clean.

Owners of grain separators and various conveyances must clean their machines before moving and free them from noxious weeds. The responsibility is directly on them. They can be sued and charged with a misdeameanor if they do not do it.

The highway department is supposed to take care of the weeds along the highways.

We have some laws that are general over-all laws. We have some laws known as the sow thistle laws where weed commissioners are appointed. I will not go into those, but I do want to make a few remarks about our weed laws. I suspect that many of our other states, also, do not have the enforcement end watched carefully. I imagine there are lots and lots of patches of serious weeds that should be eradicated and are not getting the attention they should have. Partly, it is coming down to an educational and service proposition. I think many of our county agents and county commissioners have provided machines that the farmers can use for this elimination, and also the material, rather than out-and-out enforcement and prosecution. I doubt if the counties have to make a report to anyone of the progress being made. Probably that is our weak spot in not having an over-all supervisor of our weed program.

We have one other law of wnich our seed department, of which I am at the head, does enforce. That is a seed law in which we name our prohibited noxious weeds and primary noxious weeds, and any seed distributed, sold, or offered for sale containing these weeds must be properly labeled. We do check that rather carefully each spring. We have at least two men out checking the whole state and checking all seed being offered for sale in various places. We do not reach, of course, over-the-fence trade from farmer to farmer, but we do catch the commercial seed men and the local elevators and we feel that they are doing a good job. We have checked them and we do not find so many violations. They seem to be very cooperative and anxious to eliminate mistakes.

There is one weak spot in connection with our situation. I do not know if it is true in other states. I know it isn't true as far as the federal people are concerned, but we have to prove intent to knowlingly sell or offer seeds with these weeds in them, and if they can blame their hired help, we are stuck. We check this, but it gives us a serious handicap in enforcement.

Dr. Helgeson will go over the work being accomplished through the Experiment Station, and I am sure it will prove more interesting.

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MR. AAMODT: Thank you, Mr. Hastings. Dr. Helgeson, Botanist and Weed Specialist from the North Dakota Experimental Station will continue this report.

WEED ACTIVITIES IN NORTH DAKOTA, E. A. HELGESON

Gentlemen, my report covers principally the research activities and the educational activities of the Extension Department.

The past year, approximately 210# of sodium chlorate, 83,500 lbs. Atlacide and 179,600 lbs. of Borascu were applied to the perennial weeds of the state. There were a number of small, individual sales that we were unable to obtain a record of, and they told us these were sold pretty generally to the county officials.

As far as the control of annual weeds was concerned, there were about 100 large spray rigs operating, using chiefly Sinox for the control of annual weeds in flax and wheat. I haven't a very good guess as to what the acreage might be, but Lars Jensen, our Extension Agronomist says that they sprayed about 350,000 acres. I don't know whether that is right or not. The men have to divide their activities between weed research and a number of other station projects, so the work that we can do is somewhat limited.

We have been fortunate in being able to cooperate with Dr. Stahler in summer and applied about twelve of the uniform 2,4-D experiments in various parts of the state. The Extension Service and Experimental Station cooperated in taking notes and helping to make some of these applications. That has augmented our program considerably.

One other field of work that we are engaged in is the effect of competition or competitive crops on the control of perennial weeds, particularly grass. We have experiments under way with the control of ragweed and bindweed and notes are being taken in order to make an accurate report on these experiments.

We are making a small beginning on testing of soil types and the toxicity of 2,4-D.

That just about covers the research activities.

The educational activities consist of publication of four specialized circulars which are sent out throughout the State for general use, a technical bulletin on root research of quack grass, and a number of technical papers on milkweed. We have been conducting a series of weekly radio broadcasts on weeds and weed control, beginning last spring and continuing to date. We hope that we can go on with this throughout the year.

The county's educational program has been stressed considerably this year. Some counties have put aside considerable funds for these programs and by means of the press, radio, and conferences have increased the interest in weed work and weed control.

At our Farm and Home Week a short time ago we spent an entire morning session on weed control and had a very large local interest in the group attending.

That perhaps covers the report as far as research and educational activities are concerned.

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WEED ACTIVITIES IN WYOMING, GEO. B. HARSTON, STATE ENTOMOLOGIST

Mr. Chairman, ladies and gentlemen. This report is necessarily a very extemporaneous one because I came as a visitor to this conference, being a member of the Western Weed Control Conference, and I came with the purpose of learning all that I could about weeds, because we do have some problems in common with the North Central States.

As a regulatory official, and given the responsibility of the enforcement of the law, we are under pressure between the research end and the farmers. We find that many of the land owners in the State of Wyoming are very enthused about weed control. Consequently, they expect the latest information, and they are some of the first to pick up articles relative to 2,4-D or any other product.

The State has a law, and the proposed revisions were included in our report last year. I was sorry to be unable to be at your conference last year. However, a summary of our Wyoming Law you will find in your last year's proceedings. Those special revisions have taken place since that time.

I do feel, however, that there is one part of the program that seems to be a little different than the programs conducted in the Northwestern States. That is, the State, as a state, has a recognized responsibility of the public, as a whole. In other words, the legislature makes appropriations available for weed control, and this appropriation is allocated to the counties on the basis of their willingness to participate in the program, in relationship to how much they are willing to put up as a county.

In addition to that, the land owner is expected to pay his share of the weed control work. There are some objections to that policy, but there have been some farms where the entire responsibility is placed with the land owner, and if the state and county would go in and take care of the job and charge the full 100 percent cost to the land owner, the state and county, in many instances, would be in the real estate business. I don't know how that compares with some of your conditions, but I know that the state, as a state, has a responsibility and has tried to assume a portion of the cost.

We feel that with our handicaps, we have made definite progress in the past number of years. Our county organization consists of supervisors, a county pest control commission, composed of land owners in the county. They hire a pest inspector, who has as many co-workers as the circumstances require. These men, of course, are paid out of these funds that have been made available to the county, and a proportionate amount is charged against the property in the form of taxes.

The seed law is comparable to other states. I have examined the laws of most of the other states and find that ours is in keeping with most of them, and it has the same objective in trying to prohibit the movement into our state. Every land owner in the state is given two free seed tests per year, tests of two samples per year. The seed testing after that is charged for according to the test. Our state seed laboratory is charged with the responsibility of making those tests and the enforcement is vested in the commission of agriculture, and it is in turn delegated to the division of entomology. We have found that most of the chemicals that have been used in other states, have had their place in our Wyoming weed control. We have been using chlorates as much as we could, and we have been using disulphides on small tracks, and borax, and 2-4-D has been unusually popular, even though it has not been officially recommended by the department. Land owners have taken it upon themselves to buy 2,4-D products during the past season and put it out on their own. I think that we will be confronted with that program in the future. I think the land owners in Wyoming are still rugged enough, that regardless of the recommendations from research men, they are still going to do a little testing on their own. Consequently, I think we are making progress, even though it may not be in keeping with the best information in research lines. Our land owners are eager to do something about this problem.

I appreciate the opportunity of being in attendance at this conference and learning the many things that I have learned, and exchanging views of the different control men, as well as rubbing shoulders with some of the research men who have so generously contributed to the conference.

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MR. AAMODT: (Dr. Willard of Ohio was busy and would not be able to report at this time.)

Is Mr. Bower here from Oklahoma? Mr. Bower is with the State Department of Agriculture.

WEED ACTIVITIES IN OKLAHOMA, CLYDE A. BOWER, STATE DEPARTMENT OF AGRICULTURE

Mr. Chairman, I have about three statements to make, which shouldn't take very long. First, is the fact that if this is to be devoted to the changes in our law since last year, I would almost have to sit down, because we attempted one and were not entirely successful with that one. Consequently, we do not have it.

At the present time, we have innaugurated rather an extensive program relative to the control of external parasites on cattle. I am sure that all of you know what that means, and there was a rather large outlay in spray equipment. Possibly a year from now we will have a power spray unit in each county in the State of Oklahoma for use along that line. If the proper chemicals were available, that material could very readily be used for work on weeds likewise. We don't say that that time will come, but it is something for us to think about at the present time, and one which we are giving serious consideration.

We did have a change, possibly, in our seed law which we operate in the State Department of Agriculture, relative to feed screenings. That has been brought up several times today. We likewise saw that that was a great potential danger to our state, and attempted to correct it. Our law, as you know, is strictly a bindweed law. Consequently, we don't have a lot to say about other weeds at the present time, but we feel that we can make that change when we so desire. The bindweed problem, of course, is our number one problem. Our research men at the college station have been doing work during the past year, and the Extension Service likewise has been doing a wonderful piece of work relative to the operation of these lines.

I represent the regulatory control branch of it, and I am sorry to say that so far as I know, the State of Oklahoma has never set up a county weed supervisor, as some of your other states bring forth here today. The enforcement of our law is with our county commissioners. Of course, we act in an advisory capacity for them. We have three of them in each county, elected every two years. We likewise have the problem of continued education with them.

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MR. AAMODT: Now, gentlemen, I find that I must leave you and catch a train for other points South and will now take the liberty of turning the Chairmanship over to Mr. Stoa of North Dakota.

MR. STOA: I will try to keep the program moving along as well as Mr.Aamodt has been doing.

WEED ACTIVITIES IN SOUTH DAKOTA, DR.W. W. WORZELLA, SOUTH DAKOTA STATE COLLEGE

Since our last year's meeting several changes have been made in both our laws and our program. I will try to hit the high points of both.

The State Legislature has completely revised our State Law. We have benefited a lot from the conference last year, and we have tried to incorporate many of the good features we got from all the state laws around us.

As to the high lights of the State Law just passed by the legislature last July, and which became effective then, it sets up a state weed board, which is made up of nine members. The board formulates the program and it rules and regulates. Consequently our law is very short and very flexible.

You might be interested in the members of the state weed board. They represent men from the different interests--the Secretary of Agriculture, the President of the State Crop Improvement Association, the President of the Horticulture Society, the Chairman of the Association of County Commissioners, the Chairman of the Association of Soil Conservation, District Supervisors, Director of Extention Service, Head of the Department of Agronomy, one representative of the State Highway Commission. So you see, you have a group of individuals representing various points of view. The program integrates very closely the extension work, the educational work, the research work, and the regulatory work.

I will give you a skeleton of the state organization. It is made up of the state weed board, the state weed supervisor, area supervisor in each county to set up a county weed board. The program is set up by the state weed board and is based primarily on education. I think that has been brought out in many of the discussions and it is felt by this group that real progress and real control will depend upon the farmers being sincerely sold on the deal. I think that was stressed several times throughout the meeting this year and last year by the states that are doing this effective work.

The state weed board has listed eight noxious weeds, with creeping Jenny and field bindweed foremost heading the list. We are just starting, and are becoming quite conscious of our weed problem. We have a real weed problem, and we haven't too much to report, as far as the success that we have had with this or that. We are getting it organized in fairly good order, I think. Within the next two or three months the educational work will be conducted in each county and in each township of the whole State. The extension force, at present, is conducting schools with the county agent, getting them acquainted with the program, and then each county will be divided into its own community and each farmer will be asked to come to these meetings for the educational program. Through these county meetings, they will elect representatives that will meet and appoint a county weed board. That is a "must" for every county.. That will complete the State organization.

Now, I will touch briefly on the research that is under way. In that work, we are understaffed, as I sensed many other states are. We are cooperating closely with Mr. Stahler on getting a number of plots cleaned out with the new herbicides.

Just a word, too, on the seed law. We think we have a good one passed some four years ago. The pattern is along the lines of the Federal Laws and from the committees that have been working on it, I believe it is all right.

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WEED ACTIVITIES IN WISCONSIN, HENRY LUNZ, STATE DEPARTMENT OF AGRICULTURE

You are not going to make money on me, because my report is going to be very short. I imagine a lot of people are looking at time tables and looking around the room to find it gradually thinning out, so that is another argument why I am going to be short.

I am not going to say very much about seed or weed laws, if any of your are interested in the details of our seed or weed laws, we will be more than glad to get you a copy and you will get them more accurately than I could give them here. I noted on the caption of the program that this was to be a report on "Weed Activity." May I report that the weeds in our state have been very active for the past year. In my opinion, weed infestations and the losses they caused reached a new high in 1945. This may not be true in other states. Yet there seems to be evidence that the general weed situation is the same throughout the North Central States.

Roughly speaking, there are two types of pursuasion--moral and force. Both have been tried in weed control, and the general result of both have not been altogether satisfactory. One reason for this, in my opinion, is that high prices have played the most important part in making it possible for farmers to absorb weed losses and still make money, in spite of limited labor. They have produced more by increasing acreage, rather than increasing the weed control activities.

We realize that this situation cannot continue indefinitely. It seems that on many of our farms, more serious attention must be paid in the near future to weed control. It is my opinion, also, that we will have active weed control when the farmers want it, and not before. They will want it when they recognize the necessity, and the program is sold to them. This program needs salesmen. State agricultural research men and extension men should be, and will be, the salesmen. However, I think that we can very truthfully state that some of these above-mentioned people have never taken weed control very seriously. May I illustrate? In the spring of 1945, in cooperation with the vocational agricultural teachers in some of the counties in our state, samples of seed grain, which farmers are actually sowing in the ground was taken out of the feeders. This was grain which the farmers themselves had grown on their own farms. This is not grain they had intended to clean or which they had purchased. It was grown on their own farm, and being planted. These samples are sent to the State seed laboratory and examination disclosed that over 50 percent of them contained noxious weed seeds. Now, we have advocated pure seed for fifty years. We have worked hard, but somehow or other we have failed miserably in selling this program to the farmer. I don't know what the answer is. Most farmers, I believe, want a weed control program, many of them want it enforced on the other fellow.

We must consider, as has been considered in this conference, that weed menaces are public affairs and must eventually be handled by the public at public expense.

Wisconsin has a fairly good weed law. It is administered, however, by local officials, and until we can get a weed consciousness aroused with local enforcement, we will never get very far. We realize that, and we plead guilty to it.

The Department of Agriculture conducts meetings of weed commissioners in various counties in the State. Some have set up tentatively in counties and towns to raise money for weed control. That is handled similarly to the programs that have been given to us and expressed this forenoon.

I was a little pleased a few minutes ago. I remember about twenty years ago there was one county in Wisconsin--Grant County, where the county agent became sold on a weed control program, and the county agent organized a weed control program, which was the first county in Wisconsin ever organized, and I think possibly one of the first counties in the middle west. He evidently pursuaded the county board to do something, and in that one county they purchased sodium chlorate in such quantities that they did a fine job in controlling Canada thistle. Just a few minutes ago I looked in the back of the room, and Mr. Kennan, who as county agent in Grant County at that time was here.

With that short report, I assure you that I appreciate the opportunity of being here with you, and I believe that it is through these meetings that we will finally arrive at something that will do us more good than we have ever found.

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MR. LARSON: Mr. Lunz, didn't the county agent lose his job on account of that?

MR. LUNZ: He found a job here on account of that.

WEED ACTIVITIES IN OHIO, CHAS. N. MCINTYRE, STATE DEPARTMENT OF AGRICULTURE

I am not so concerned with this report, but it occurred to me that perhaps my immediate superior might wonder what the justification was for my expense card.

The report as made last year adequately covers the situation in Ohio. The fact that we were on the fringe of this group of states does not mean that we do not have weed problems. Ohio was the second state to enact legislation to cover the control of Canada thistles through seed, but unfortunately, we have not kept pace with the modern trend of legislation on weed control, although we do have adequate methods of controlling the sales of seed.

The report this year is one of general increased interest. The Ohio seed association have gone in favor of a revision of a seed law of noxious weeds and have appointed a committee, consisting of a representative of the University, the Experiment Station, and the Department of Agriculture to study a revised weed law. The Ohio Farm Bureau have indicated that the gas line tax fund should be used to control the weeds on all roads.

We are very interested in the reports of this conference for future guidance along the lines of weed control. Thank you.

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WEED ACTIVITIES IN ALBERTA, CANADA, A. M. WILSON, FIELD CROPS COMMISSIONER

Mr. Chairman, ladies and gentlemen. I am very grateful to have the opportunity of attending this Weed Conference as a visitor, and one also who is looking for that $5 worth for 50 cents. Perhaps it will be on this lend-lease program that I can take this information home.

In Alberta, within the last few years, we have been pretty well acquainted with people across the line. Sometimes I wondered whether I was in the United States or Canada, because there was the same approximate number of men in the Uniform of the United States Army, as with the Canadian uniform. When it came to house hunting in Alberta, it was an open season and the survival of the fittest.

On may trip down on Monday, half of the people that got on at Edmonton came though to St. Paul, and most of them were army personnel returning for their discharges from the services. I don't know just how far Alberta extends north, since we have that new road open to Alaska, but we blame all of the cold weather in Alberta to having that road opened up and that cold air comes down from the north pole, and the last few years we have had some rather nippy winters.

I don't know, either, how far our agricultural lands will extend north, because whereas there is some international boundary line, we did go up 600 miles, or so. I know that we are considered to be relatively near the north pole, and the road goes through another 1400 miles, so it is still quite a distance.

The northern section of our area is relatively new and relatively free from weeds. In fact, there was a lot of that country which I think in time in the future, will be settled with farmers and our hope is that we will be able to keep it free from weeds.

In Alberta, we pride ourselves on clean seeds, although sometime this pride is pretty well dropped to a low level. We do have that area that still has no weeds in a carload, but that area is quickly being diminished. Sooner or later, the clean lands of the north is going to be subjected to the same number of weeds that we have at present in the areas farther south.

I don't know just how far to go in this report. I have made a few notes, and there might be some items of interest. We have had weed legislation in Alberta since 1923 and at that time we had clean lands, or relatively clean lands, We were in hopes that we could legislate these weeds out of existence. However, time has had another opinion and has forced us to change our minds. The legislation is only effective so far. The legislature has tried to embody means of enforcement to keep these lands clean. However, as I have said previously, in spite of this enforcement, or attempted enforcement, our lands are not clean at the present time. The legislation was changed last year. I think it is quite significant from what I heard at this meeting, that farmers, as a class, are quite willing to support new legislation and support new appropriations. It is rather a concern, and I see this is a long-

term program. Sometimes these appropriations aren't as long-termed as the amount of time required to change an agricultural plan that will control weeds.

In 1923 to 1929, we had large appropriations for the control of weeds. However, during those years of 1930 the appropriations, along with farm income, were reduced to the point that the program was somewhat neglected, and I fear that at the present time, we might be able to get larger appropriations than a long-time program could successfully use.

A few problems that come to my mind, that I have heard at this meeting. The one of screenings has troubled us for many years. I note that some of the other states, such as Kansas, mentioned that this exchange of grain containing screenings was quite a problem. I must admit that our weed, wild mustard, is largely spread through central cleaning plants from which grain is cleaned and removes 95 percent of the weed content in them. Unfortunately, it replaces one of two wild mustard seeds in one or two pounds, which is quite sufficient to give a very good start.

Another problem that we are concerned with, is the dormancy of the seeds, particularly with respect to wild oats. Our farmers, over a period of years, built up high hope that they have their land free from these wild oats, and about the time they are completely confident that there is none left in the soil, they were suddenly reminded that these things had been lying there until the opportunity came that it was expected would become very troublesome.

The Domion has done some work on the germination of these wild oats. However, I think we have just got that part of research scratched on the surface because they seem to behave without any respect to rhyme or reason.

Another problem that we have is that the enforcement is through local boards, by a supervisor appointed by that board. However, I see that our enforcement program, or educational program, is entirely dependent upon the nature of the Board and more particularly upon the supervisor that this board employs. Our problem recently has been to get the supervisor who makes that a life work, rather than one who uses that as a means to get on to some other job.

The weed program has taken forty years to reach the point it has today in our Province, and I cannot see a supervisor who is working on that problem from year to year, accomplish very much.

As a Province, we are prepared to pay a portion of that salary to the supervisor employed by the local boards, with the hope of having him employed as a permanent man, who will be interested in the work, and who will look to the future that when a field is heavily infested now, it may show improvement in five years' time.

A good legislation is necessary, but in my own way of thinking, an extension program is about 85 percent of the control. If we have to apply legislation you can use that enforcement for this year, but it has to be continually reported to get any long-time program in effect. I doubt very much if we can look at a long-term program by relying too much on legislation. If we can take the top two-thirds of the farmers and educate them to use farm practices that will keep their lands clean, and take the other one-third and rehabilitate them and exterminate the weeds, then I think we may be able to accomplish something. There must be some way of combating the operations on a farm of an incompetent operator. That legislation is necessary.

The one change made in our legislation last year, was quite effective in the controlling of weeds. We think that if it is through negligence that the farmer incurs a liability to the district in destroying weeds, we have a right to step in before that reaches the size that requires the municipality to take the land over. This new legislation provides the local boards with three measures--they declare lands subject to supervision. If that supervision provided for through our county supervisor is not acted upon, then we can subject it to rehabilitation, and in a rehabilitation program, there are funds available to good operators to help them to get out of difficulties and it becomes under the direct management of the local board.

We are in the experimental stages in this line. A number of our boards have taken lands over this year, and we hope that in three or four years' time we can return it to the original owner as a good farm. We hope that in that period, we not only clean the land, but rejuvenate that operator. We have wonderful support from the farm public in the last few years. I think that meetings are being called through the extension service at the present time and questionnaires sent out from various districts. I would say that 80 percent of them are for calls on weed control and conservation of soil.

I will say very little about seed laws. We, across the border, have one uniform Seed Law that covers the entire area of Canada. Our office is entirely segregated from having to deal with the grain, or making regulations with respect to the sale of grain. We think that it is handled in a very effective manner in federal hands.

Mr. Chairman, I must say again, that I greatly appreciate the opportunity of coming to the meeting, and I am going to go home with rememberances of the information that has been passed out. I have my pockets filled with all the notes that I can get, and all the information from the side tables. I hope that in another year we may have the privilege of sitting in on a meeting again. Thank you very much.

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WEED ACTIVITIES IN SASKATCHEWAN, T. K. PAVYLYCHENKO, UNIVERSITY OF SASKATCHEWAN

Mr. Chairman. I think that enough was said about the weed laws. I will not take time to review the weed laws in Saskatchewan. It is a pretty good weed law, as I see it. But, as mentioned before, weed laws may be very good on paper, but in practice, it may mean very little because the actual knowledge of different weeds, the means of control, and the consciousness of the people of the extent of the weed problem, mean much more than the weed laws.

The Saskatchewan weed law classifies weeds into three classes--primary noxious, noxious, and dormant, and it stipulates the percentages allowable, etc. The enforcement of laws lies with the field crop commissioner and weed inspectors, if they are appointed. Otherwise, it is just for general use and general knowledge that such things exist. The administration of the weed work is, in my opinion more important. Again, it is placed with the Federal crop commissioner and then, the weed inspectors and federal representatives. They are entitled to see that the law is put into operation, and if necessary, that is enforced. The weed inspectors are employed by municipalities, but to be frank about it, we should say that the quality of the weed inspector is governed mostly by the degree that each municipality understands and realizes the importance of the weed problem, or by the fact that they have to pay men that are available and willing to do the work. Usually, the best man is not available for that position. If he is a good farmer, he doesn't care at all to travel around and leave his farm for $6 a day. Alberta takes the matter in a much better way, in making that position so attractive that the man would consider it is life occupation at the higher levels. We haven't reached that stage yet in Saskatchwan.

The Extension Department of the College of Agriculture is taking an extremely active part in educational programs. The educational program is carried on in two different ways. The Extension Department cooperates closely with the research work at the University in weeds, and tries to disseminate the information in a digestible form to the farming public. Probably still more important is the fact that the Extension Department managed to organize weed clubs throughout the country. Boys and girls are encouraged to enter the clubs, clean out the weeds and get information from every possible source. You would be surprised how those youngsters write to the Dominions Department of Agriculture and to the University for information all summer, and then the weed competition is carried throughout the province and they have contests, and in that way, youth is stimulated in weed work and weed problems.

Now the next point, not mentioned here, is the so-called weed committee of Saskatchewan. The weed committee is a body which meets once a year and sometimes twice a year or more, if necessary. It is composed of a man engaged in research, in extension work, and some farm organization, and the whole field of weed work is reviewed. Then they sit down and agree to certain fundamentals and practical recommendations with respect to controlling weeds. They put that set of recommendations in a form of a so-called Weed Guide to Saskatchewan. We have "Guides to Farm Machinery," and all of that information is in a clear, concise form, where every word is critically considered as the Saskatchewan Guide to Crop Production.

That information is published in many thousands of copies and sent on request. Generally we have about 12,000 to 13,000 copies assimilated every year.

The research work is carried on by the research laboratory of Plant Pathology at the University of Saskatchewan. This organization was created by the National Research Council and still is supported by the funds from that body, but is allocated at the University. We consider the fundamental research on weed plants and crop plants as they grow together, and study them under a few conditions. We have definite information which is then assimilated in the publication from the laboratory. The work is concentrated mainly on fundamental problems of weed control.

Now, the competition between weeds and crops is one of the basic problems which we consider. Each weed and each crop has its very own competitive part, when they grow together. We claim that were it not for the competitive power of our crops, we would not be able to grow anything in Saskatchewan but weeds. We do quite an extensive work along the roots of crops from which we know how the competition goes on and why certain methods are promising greater success than others, etc. Then, on the basis of that information, we try to outline the methods of controlling annual and biennial and perennial weeds under field conditions, and it has proved quite satisfactory.

The general plan is to utilize the research data to base the practical methods of controlling various weeds.

Chemical ways of control is another phase of our work. We do quite a lot of work in that direction. Sinox is a feature in weed control, and we have spent quite a lot of time in studying it and the response of different weeds and crops to Sinox treatments. We have very valuable and important information from that work.

2,4-D and sodium chlorate work was also undertaken for sometime and we feel that it gave us a much better understanding of why certain chemicals are effective and others are not effective in eradicating perennial weeds.

As a result of this research work, we tried to derive the educational material from it so that one film was produced in Saskatoon some years ago on the relation of various root materials, particularly grasses, to control a soil erosion by wind and water. This year, another film is produced from Sinox work in Manitoba, Saskatchewan, and Albenta, which will be quite helpful to bring the weed problem to the attention of the farm public.

Publications are also put out in a scientific way, and they are distributed as far as possible to the public. Recently we inaugurated new activities, which is the detail weed courses for weed inspectors in the Province. We divided the Province into sectors and call in every weed inspector, to that weed course. We bring all of that research data to them in the form of diagrams and actual information. They sit in on those weed courses two or three days, and we found that it is quite possible to bring farmers and representatives of municipalities to those courses and keep them from eight o'clock in the morning until four o'clock in the afternoon. We preach it so much, that they are willing to take that hard, tedious work for three or four days without any complaints at all.

To conclude, the weed problem is entirely fascinating to the people in the world, but the information on that problem should be brought to them in such a way that they clearly and easily understand it, and it should not be presented in an abstract form, but in a very tangible, practical way. There is no fear that the people would not be interested in it.

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WEED ACTIVITIES IN MANITOBA, H. E. WOOD, WEED COMMISSIONER DEPARTMENT OF AGRICULTURE

I would like to extend my appreciation for the courtesies given at this conference. I am no stranger at this side of the line. I have met a lot of friends and quite occasionally we find a number of them coming up to Winnipeg.

Extensive grain farming leads to the spread of weeds. While the first of the Prairie Provinces to be settled, most of Manitoba's 10,000,000 acres under cultivation have been broken from virgin sod since about 1890. On the 58,000 farms, about 50% of the revenue derives from cereals--chiefly hard spring wheat and barley in about equal acreages, followed by oats. Only about 7% of the acreage is devoted to legumes and grasses; about 20% is summerfallowed annually to conserve moisture and to control weeds. Weed control is administered through a Noxious Weed Act, authority being delegated chiefly to the local unit of government--some 118 rural municipalities.

Of numerous annual weeds, wild oats and wild mustard are most widespread, and take the heaviest toll. They are the most difficult to control. Perennial sow thistle, which almost disappeared during the drought-grasshopper years of the thirties is making a real come back in the last two or three years of above normal precipitation. Mechanized farming has gone far to eradicate couch or quack grass, and is the hopeful feature in the solution of the sow thistle menace. Of the deep rooted perennials, leary spurge is the main offender, being found on about 1,500 farms with an estimated infestation of 20,000 acres, 12,000 of which are on light marginal to sub-marginal soil.

An organized campaign to eradicate the deep-rooted perennial weeds has been in operation for five years. Seventy municipalities comprise 15 municipal weed control units, each employing spray equipment which goes from farm to farm, treating all small and scattered patches of this group of weeds, with no charge to the farmer. The Government purchases chemical--Atlacide--in carlots, assuming one-third of the cost; the municipality bears the balance, plus about the same outlay for application. Since 1940, 1,089,000 pounds of Atlacide have been used for a total outlay of approximately $157,000. Results: farmers have become weed conscious as never before; much more leafy spurge, etc., has been discovered than was ever dreamed of; many thousands of scattered patches have been eradicated and some three hundred farms freed entirely of the weed.

A further step under this plan has been the inauguration of a program of "intensive cultivation" alternated with cropping. Under an amendment to the Noxious Weeds Act in 1942, municipalities were given very wide powers to declare and take over weed-infested properties. In the last four years, some thirteen properties, totalling over 1,100 acres have come under this plan. Results have exceeded expectations. Where the soil is reasonably good, most of these jobs will be self-liquidating. On relatively few farms can the owner or tenant follow through the rigid program necessary to success. We hope to greatly extend this method of eradication as a post-war measure, the government cooperating financially with the municipalities.

Hand-in-hand with these two methods of attack has been a more limited, but none-the-less effective one--pasturing leafy spurge with sheep. Most excellent control has resulted. Sheep are particularly effective on the lighter soils where infestations do not lend themselves to intensive cultivation,

Our second major endeavor has been to demonstrate in 1944 and 1945, in cooperation with the manufacturer and their agent, the use of Sinox in the eradication of broad-leaved annual weeds in cereals, flax, and field peas. The results in the main have been highly satisfactory. Twelve farmer rigs operated in 1945. Purchasers were pleased with results and indications point to a very marked extension in the use of Sinox.

In the last few years, increased attention has been directed to destroying weeds--mostly annuals and the less serious perennials--on road allowances of which we have over 91,000 miles. In addition to enforcing mowing, etc., some 10,000 pounds of grass seed was supplied free to twenty municipalities this past spring for seeding down road allowances.

In addition to the programs briefly outlined, we do not overlook the fact that after all, upon each and every farmer rests the responsibility for the control of weeds on his property. To this end, he is helped and encouraged through the well-established channels of press, radio, bulletins, films, weed displays, meetings, etc.

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WEED ACTIVITIES IN CALIFORNIA, WALTER S. BALL, STATE DEPARTMENT OF AGRICULTURE

Mr. Chairman, I didn't know that I was to report because it wasn't on the program until our secretary cornered me and said I had to say something. I realize that you haven't much time, so it isn't going to take me very long.

In California we have every weed that grows, and if we haven't, it will come in and we will find some place for it to become established. They all do.

We do have a very serious weed problem in California, in that we do have varied conditions, climatically, from below sea level up to sea level, and the result is that practically all weeds are introduced and can find a place somewhere to become established.

We have several weeds that have not been mentioned at this Conference. I believe they are weeds that none of you have, but they are serious, as far as we are concerned, and we are attempting to do all that we can to control them.

Legislation has been mentioned here this morning. One fellow out on the mezzanine this morning said, "Ball, if you report, don't go into your legislation, because your book is about an inch thick." That is true. At our next meeting we are going to make some regulations for another book. But we do attempt to enforce our provisions and I think we have profited by such enforcement.

I do feel, however, that legislation is necessary and research is necessary and education is necessary before we can effectively enforce laws. I think the individual concerned has to know what the picture is and where he is going before you come in with the law and effectively use it.

Our seed work, of course, is a little different picture. We do have enforcement, and that is a matter, more or less of a routine set-up, as far as our quarantine is concerned. But in that, too, we attempt to enforce, and I think we have gained a great deal by it.

The other form of legislation which we have, which I believe is working out, was also mentioned here this morning--I think something that is going to prove beneficial in any state. That is for appropriations to be made by your legislature for newly established weeds of limited infestations, so that a good, progressive, well-organized program, which will bring results, will be carried on, regardless of your elections or your political set-up.

Texas blueweed has come into California. We had no trouble in getting funds to assist in the eradication. It is confined to five counties.

Perennial sow thistle is in two counties that we know of, and we are attempting to get rid of that by appropriations.

Any of the legislation which is set up as an objective, and which you are able to carry on in a good program, and get results, will start to get the people concerned. We have found that true.

One of our other programs that has been very effective during the war years is that of our selective spraying. Thos of you in California know that our vegetable growing areas, especially where we have our winter vegetables, the weeding problem in onions, carrots and garlic is a very expensive process, averaging about $85 an acre. During the war, it was impossible to find hand labor. There were hundreds of acres of these crops that were being disced simply because they could not get help to harvest. There was a definite need for this crop during this time. The government had asked for heavy production, and everything was being done to get it, until we did get it done with oil, as far as carrots were concerned, and Sinox, as far as onions and garlic was concerned. We had a couple of thousand acres of carrots that was not being given too much consideration, until we got in with our fuel oil and were able to help those people handle the weed problem, so it turned out to be a very profitable program, and one that is going to carry on, because we were able to have the work and the weeds handled in those areas from $8 to $10 an acre by commercial operators and $8 against $85 makes quite a lot of difference. I think from now on, selective spraying of vegetables is going to continue, and we are going to have a big field to carry on.

We have a lot of diversified weed control there. We have many problems and we are going to carry out as many problems as we can.

Our railroad and State highway problem is one that we are all concerned with, and which our pathologists are working on closely with us on weed species.

In one of our areas, beans had been the most profitable crop for years, but although they were able to grow 18 to 20, and in some cases, 30 bags per acre of beans, the production went down to 3 to 10 bags. We learned that what was causing all of this trouble was prickly lettuce and sow thistle, and we were able to get the cooperation of the county railroads and farmers and we eradicated this plant, or controlled it to the extent that the bean business went back into this particular area.

I think in this whole program, we have to consider all the various angles of weed problems. They are not just problems we have before us, throughout the West, it is a costly program. We have weeds that are difficult to get at and the losses are high. We are trying to handle our problems as best as we can.

One of our problems out there is our Klamath weed, where we have 100,000 acres on the coastal area of grasses that normally can be cut for hay, and we have a fine area there, as far as the grass crop is concerned. Animals normally are turned on that area and grow fat for the market--probably not as fat as your corn-fed beef, but they are fat. When you take that kind of foliage and think that 100,000 acres are taken over by one weed, we do have a problem, and we are attempting to handle it as best as we can. We can't do a great deal on this particular spot. We have used

borax, and one county used 120,000 carlots of borax in order to control the weed and try to suppress it in this county. An insect has been imported from Australia, and we have carried out all of the necessary starvation tests in order to learn whether or not this insect is going to be injurious to other crops, and we have satisfied ourselves that is is not, so we are hoping that this will control Klamath weed.

We have a cactus problem, and several problems that we feel that biological control might enter into the picture, so we don't feel that 2,4-D is going to answer all of the problems.

We are going to continue working on those things which we have worked on for some time and use them in their place and where they can most practically be handled with the best benefits.

I don't believe I should take any more time. Thank you.

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MR. STOA: California is not all sunshine, then. This concludes the program. I want to thank you for staying within the time.

We now stand adjourned (12:30 P.M.)

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WEDNESDAY AFTERNOON SESSION

The Wednesday Afternoon Session was called to order at 1:40 P.M. on November 28, 1945 in the Spanish Room of the Hotel Lowry, St. Paul, Minnesota, by Chas. H. Keltner, Chairman.

MR. KELTNER: We are going to start out with an address by Walter S. Ball of the California Department of Agriculture on the Western Weed Conference.

REPORT FROM WESTERN CONFERENCE, W. S. BALL

I don't know where he figures I have any snap! I don't think he saw me last night. Well, as far as the Western Weed Control program is concerned, I feel very much at home, because the attendance right now is just about the size of our attendance out there. Had it been as heavy as yesterday, I would have been out of place.

At our seventh annual meeting, we had around 100 interested people there to carry on and join in our program, and we had a very good meeting. I might say that our programs are of a very diversified field. We try to cover a lot of the various fields in order to interest as many people as possible. In order to maintain interest, I think we have to try to hit those various topics relative to weed control that is of interest to different people in the organization.

I am also very glad to note that after some twenty years, that I have been trying to keep alive in this job, we do have crowds such as we had--and when I say crowds I mean the houseful that we had yesterday. It was very encouraging, and I think the banquet last night was encouraging, as far as weed control is concerned. Those of us who have been in it, and there are some here that have been this work much longer than I, such as Dr. Bakke and Dr. Zahnley, and a lot of those people who have been in it for a long time, have talked before farm bureaus when most of them went to sleep and some baby was crying, and we still tried to tell them something about weed control. In those programs, that was always the last thing on the program, and that was about 11 o'clock, and those who have attended farm bureau programs, know what I am talking about and know how difficult it has been to try to get interest in weed control. Over the years that we have worked with it, I think a lot has been accomplished and I think that we are now going to get somewhere. It is up to these organizations to really do something about it.

Last year, we had Governor Gossett address us in the welcoming address. I was particularly interested in the fact that he had had some experience with weeds and their control. I was most certainly pleased last evening to hear the Governor of Minnesota speaking as he did and know as much as he does about weed control. After all, I think that is where we are going to get interest and it is through such individuals that we are going to get support.

Last year, as stated before, we had a rather diversified program. We had one paper presented by Dr. A.S. Crafts of the University Experimental Station on oils. We haven't heard a great deal in the North Central States' Program. Possibly, this is because you have no place for oils. In California, and in the coastal areas of the Western States, we do have, and there is a great deal to be had from various types of oils.

Dr. Crafts has worked out some very interesting data on this finding of the different types of oils and the different oils that are particularly toxic. We are going to use them eventually as carriers for some of these other products. We have already entered some of them into the 2,4-D Program. With those, I believe that we are going to find another side that fits into the picture.

Inasmuch as I am reporting for the Western States, I will give you some of the California experiences as far as oils are concerned, and that is the use of oil in the control of weeds in citrus, particularly, because we have done more work in citrus than any of our other control work. Oil has been used there, rather than cultivation. It has, more or less, been a conflict to many of the practices which have been recommended by the Experimental Station in regard to cultivation. We have hundreds of acres of citrus that are not cultivated and are treated two or three, or as many times as necessary, throughout the growing season for the control of weeds. They make permanent irrigation ditches and irrigate when needed. They fertilize with commercial fertilizers but they do not cultivate. The results are that the crop seems to be just as good as the crops under cultivation for weed control, and the quality of the product seems to be just as good.

There are large operators who have tried both, and it appears now that we are going into a great deal of oil or contact spray work. It doesn't seem necessarily, that it has to be oil, but oil does not effect the trees and it does seem to handle even our rennial weeds. They have reduced morning glory, or bindweed in some of these groves where repeated applications of oil have been used, so for that reason, we asked Dr. Crafts to give us a paper on oils, and he covered it very well in our last meeting.

We are very much interested out there in our Federal lands and the work that they are supposed to do. They really don't do a great deal, but they have attempted to have someone from the Indian Service, or the National Forest Service to meet with us, because we think that they, too, have just as much of a problem as we do.

We were fortunate in having a Mr. White from the United States Indian Service of Utah with us. He didn't have a great deal to offer, as far as a presentation of a paper was concerned, but he advised that he was willing to cooperate and get into the program if he could get funds. Our problem seems to be that we do not have adequate fund as far as some of these services are concerned and I believe that these two organizations of the Western Weed Control Conference and the North Central Weed Control Conference are now in a position to give some support to these various organizations, who are deserving of it. The personnel of these organizations would certainly like to have it.

We also had a Mr. A. B. Balcumb give us a paper on the "Control of Water Weeds."

The irrigation problem, as far as the Western States is concerned is much more of a problem than here. Water Weeds cost Agriculture, and those people being served by those various irrigation districts thousands of dollars annually for the control of weeds. Through these irrigation systems we have a natural source of infestation and spray, which we think is very important. Mr. Balcumb gave us a very good paper and he brought out a great deal relative to a new material used for the control of water weeds. This material is known as Benachlor. It is a material that we sprayed into the water. It forms an emulsion carried by the current of the water and is a toxic to the plants growing in the water.

There are three different types of water weeds that Mr. Balcumb mentioned, those growing out of the water, such as cattails, and so far, Benachlor has been effective only on those weeds. Those weeds have caused a great deal of trouble in cutting down the carrying capacity of irrigation systems. It does seem effective on those, and is used effectively in our Imperial Valley in California and other irrigation systems. We feel that there is a great deal of work to be done on Benachlor. They have already shown that by readjusting their formula, they have increased the toxicity. There is a problem that has to be worked out, relative to the danger of damage to crop plants during the irrigation season, but they are showing different ways of getting rid of the water used as a carrier of this material for the control

of these various weeds. That was a very interesting subject in our Western Weed Control Program.

We have another problem brought up by the State of Nevada. Those of you that are acquainted with Nevada at all, know that the Agricultural interests in Nevada are very limited but the range area is really a problem, and their cattle and sheep industry is their chief industry, and one that they give a lot of attention to. They have found there, a plant known as Halogeton glomeratus. For those of you that wish to follow it through, it is succulent and quite toxic to sheep, and it seems to harbor the carriers of sugar beet virus. For that reason, the people of Nevada are very much interested, as they do have a problem.

Utah and Idaho are finding that they have some weeds and they, too, are interested. We had a very lengthy discussion on their particular weed, new to most of us in the West, and probably something that you people have not experienced at all in your district.

We had Mr. VanMeter, in charge of the Forest Service, who is a very peppy speaker. He had a lot of ideas that brought a lot of ideas and discussion. He really stuck his chin out, and I think all of us took a crack at it. He did bring out a lot of important facts and discussions relative to the Forest Service and the problems that both of us have in the Western States because the forest land out there comprises a great deal of area, which constitutes a great many of our weed problems, primarily those of poisonous plants, because he was interested in the grazing program. We didn't agree with him 100 percent, but he did have a point.

Klamath weed, as far as his district was concerned, seemed to give him quite a lot of concern. We carried on quite a lengthy discussion, relative to 2,4-D. I think you people heard something about 2,4-D yesterday. I am not going to spend much time on 2,4-D because it is coming out of the ears of a lot of people, before we got out last night.

Dr. Robbins, whom many of you know, led the discussion and did it very ably, with the help of Mr. Seally, who is with the Federal Department in the same capacity as Mr. Timmons. This panel discussion was one of the most interesting parts of our program. We did discuss 2,4-D pro and con and we did not have as much information as we do now, so therefore, it was not necessary to go into it quite as extensively as we did here. It was interesting, however, to note that when we finished this discussion, Dr. Robbins asked the opinion of several of the men there of 2,4-D and the general opinion was that we didn't know a thing about it and we had better be careful as to where we are going and what we do with it.

Our report relative to some of the injuries we have had has been important to us, and we are working on 2,4-D because we think that it has a place in our weed-control program. I do not think, at the present time, that 2,4-D is a cure-all for our weed-control problems. Until we get more information, and until Dr. Kraus can find those various conditions in each and every individual plant that we have to work out, I think that we are going to have to stay with a little arsenic and a little oil and a little sodium chlorate, and some of borax and use those various materials in the places where we know they will work. I think that the interest that we have now, and the competition that we are going to have, is going to bring some of those materials down to where we can use them for weed control. We can very effectively use them. In California, particularly, we feel that everyone of these materials that have proven successful under some of these conditons has a place. I can say that ammonium sulphammate is the best thing that we have on poison oak, which is a very critical problem in California. We feel that the weed control program is a very, very, large extensive program, and we can't do any of it with any one material.

I think Dr. Zahnley and some of the other boys will agree with me that we are going to have to use every means that we can find to control weeds and we are not going to do it with any one material. We are going to have to continue to encourage cultivation and good farming practices. I think that all of us have gone up and down our states and have found farms that are clean of weeds. If we look at that farm, we will probably decide that that farm is clean because that man is a good farmer. It is unfortunate that we have so many rented farms and leased farms where people actually mine the lands and where they do, those of us in weed control work are going to have to carry on and control weeds under those conditions.

At the closing of our meeting, we elected officers and for the seventh time, I was elected secretary. I don't know why they don't get somebody else. Any of you

who are interested in working with our men, we have Mr. Kuhns of Idaho, who is president of our organization for the next year. They have done a lot of work in Idaho and I know he will cooperate with all of you, if you have anything to carry on with him.

As usual, we always have resolution for a long, long, time and we wonder just how effective resolutions were. We were very much interested in trying to take advantage of the statement I made a few moments ago relative to the organization which we now have, of the North Central States and our Western Weed Control Conference.

We feel that there is a need for greater federal cooperation and assistance. There is some little difference relative to whether or not a big appropriation should be requested from the federal government. Some feel that they want to handle their own state programs and not have the federal people tell them how they are going to spend it. But we feel there are a number of good state programs that should be coordinated and research problems that should be carried on by the Federal government. In that, we did pass some resolutions at our last meeting, requesting some federal assistance.

I am just going to give you the final resolution and leave out the "whereas's" because you all know what we do to build up something. "The Western Weed Control Conference will go on record as recommending that Congress create a division of research at the earliest possible moment, and that this division of weed research be established within the Bureau of Plant Industry, Soils, and Engineering, to establish basic weed research in connection with the experiment stations throughout the United States." We felt that that is definitely needed. I think that our good friend, Dr. Kephart has proven to us that coordination is needed. He has traveled around and tried to keep us pretty well up to date on what is happening in these other areas. The last time I talked to him, he thought maybe he would retire some day, so we had better get things lined up to get a successor for Kephart. Maybe not as good, but it is something that we have to have, and we have a lot of problems that are really problems that we, as individuals are not going to handle. We are going to have to have cooperation and coordination.

Another resolution was, "Be it RESOLVED that the Western Weed Control Conference request the Federal government to provide funds for an effective weed control program on all Federal lands, including national parks, and Indian reservations." I don't know how extensive that program is, in our respective states, but to us it is a real problem. We are hoping that we can get the Federal government to do something, and through this coordination, we may get through Mr. Kephart's office, he will be in a position in Washington to work with these Federal agents and let them know what our problems are, and how extensive they are and what this is costing the agricultural lands of the various Western States.

That, I believe, completes my report on the western weed control conference. I would like to take a moment to give you some idea of the meeting that we had following our report, on the seed officials of the Western States. I also have the job of handling California's seed laboratory and the seed inspection work in California. We called a meeting in Boise, represented by the cooperating officials of the Federal Seed Act and the different states, and we attempted to work out, as far as possible, uniformity, which we felt is very important. We think it is important for this reason. We know that seed firms, as far as the West is concerned, and I am referring to the West because I am not familiar with conditons here, do not concentrate on selling seed in the state in which it is grown. Therefore, we have interstate movement of seeds throughout the Western States, and I know the United States.

We know that it will be of much benefit to the seed trade, if we can get together and have some uniform regulations. California has always been on the spot, because they have a list of noxious weeds probably as long as your arm, and nobody knows why we do it, but we have eliminated a few and we do feel that if the other states are not in accordance with our list, as far as noxious weeds are concerned, that if we can get together on eight or ten or twelve of the most important weeds, that we will be giving some service to the trade,to the extent that they will know what we are doing and why we are doing it.

There are other features in the seed regulation field that I think can be brought out. I think as soon as we can get to some uniformity, it is going to be a much better program, because we have certain states that are not carrying on a great deal of work and they can't because their finances are such that they do not

have the money to carry on the regulatory phase of this work.

In our state, they cooperate 100 percent on this inter-state stuff, and we hope that we can continue to work out uniformity in this seed program. I don't know what your interests are here in that sort of thing, but if you could get your seed officials with you in this meeting and have time to take a half day to discuss seed problems, I think it would be helpful. I have heard throughout the meeting that seeds are brought into the picture and they definitely are, as far as dissemination of weed seed is concerned, and it ties in so closely with weed control that it is a natural to work in with our work. I hope that if you do that sort of thing, we can get our Western seed officials lined up to where we can extend our uniformity throughout the North Central States.

There is only one other thing that I want to mention which has been mentioned here several times, and I think it is coming up again this afternoon--and if I do it now, I won't have to do it later.

When we organized the Western Weed Control Conference some seven or eight years ago, we discussed the possibility of permitting commercial men in our organization. At that time, the commercial men were very fine to us and we decided, however, that it would be our organization, consisting only of the official representatives from the eleven Western States, each to be assessed $15 annually. We started out, however, without anything, and several of these companies were generous and they contributed $50 to $100 or $150 to get us started. Our second or third meeting we decided that inasmuch as we were not spending this money, it was needless for these commercial men to contribute, because we were getting along very nicely with our state people. It has happened that weed control has gone into the various fields rather extensively and the commercial people are taking more interest in weed control than they ever did. We are losing some of our research men, such as Rainer in California and Harris of Oregon, and some of these boys who have contributed a lot to our Western Weed Control Conference before they went commercial. We acted upon it that we should continue to have the services of these men because it takes the commercial man, the farmer, the state department research men, and everybody, to complete the picture in weed control, and we think that those people should have an active interest. There were comments which we had here, and we had them there, that if we let the commercial men in, they would take over, but, if we are not men enough to hold them down, they ought to take over. We have so far, and we think they are a good bunch of people. We have had them out there and they have entered into our program silently. We couldn't get them to talk because they were commercial, but by having them members, they can enter into our program and we feel that they are going to be a help to us. We have, however, confined our invitation to manufacturers only. Any retailer or jobber that is handling material of this manufacturer is welcome to our conference and welcome to get into the discussion, but we think that by having a commercial man there, he is going to add to our program and he is going to be in a position to better understand our problems,because we have a lot of them. Between the two of us, we will smooth out a lot of things that in the past have been real problems.

We decided to do that last year in our Western Weed Control Conference, and I know that thing is coming up on this program, so I am giving you that to use as you see fit. Thank you.

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MR. KELTNER: The next talk on our program is a report on the Canadian Weed Activities, by Mr. H E. Wood, Winnipeg, Manitoba, Canada, Weeds Commission, Department of Agriculture. He is substituting for K. W. Neatby, Chairman of the Dominion Weed Commission of Winnipeg, Manitoba.

CANADIAN WEED ACTIVITIES, H. E. WOOD, WEED COMMISSION MANITOBA DEPARTMENT OF AGRICULTURE (Substituting for K. W. Neatby, Chairman of the Dominion Weed Commission)

Dr. Neatby asked me to express his regrets in not being able to attend this Conference. He is one of our outstanding citizens and has been for a number of years. Dr. Neatby is Chairman of our National Weed Committee, of which I am a member, and I think it was for that reason that he asked me to deliver this address, of Dr. Neatby's compilations and some additions that I made with his consent.

First, allow me to acknowledge the courtesy extended to Canadians through invitations to this conference. We, in Canada, derive incalculable benefits from

our membership in many United States scientific and agricultural bodies. We are proud of the welcome so universal "south of the line," and proud to know that our pride in our own agricultural work is shared by our hospitable neighbors.

Weed work in Canada has a polyphyletic origin. Unhappily, the various courses of evolutionary development have proceeded along parallel, or even divergent lines, and the convergence which we all acknowledge to be desirable has not been realized. It is neither necessary nor desirable to lay too much stress on our difficulties, which, we suspect, are shared to some extent by our American brethern. Indeed, we believe that one of the chief purposes of this conference is to achieve a more sensible coordination of weed work.

Broadly speaking, there are four phases of weed work for which professionally trained agriculturists must assume the responsibility. They are:

1. Research and experimentation on weeds and weed seeds.

2. Weed surveys and identification services.

3. Education and extension, including field demonstration of approved control methods.

4. Legislation

Many different agencies interest themselves in weed problems. Among these are:

1. Several, more or less independent divisions of the Dominion Department of Agriculture (Division of Botany and Plant Pathology, Field Husbandry Division, Illustration Stations Division, Plant Products Division).

2. The National Research Council

3. The Provincial Departments of Agriculture, of which there are nine

4. Universities

5. Radio networks

6. National Film Board

7. Various private concerns.

It goes without saying that one of our most urgent needs is a well coordinated program of work that would exploit the facilities of all the above agencies and pay due attention to all phases of the weed problem. There is a very little overlapping of effort, but many problems receiving but little attention from anyone. Relative to the magnitude of the problem, second only to drought in Western Canada, at least, absurdly small amounts of public funds are appropriated for weed work. Only two or three men in Canada are devoting their full time to weed research. It seems relatively easy to get money for plant breeding, plant pathology, entomology, soils, etc. But for weed work; no! This situation would be less disturbing if our weed situation were static, but it is not. Several species have extended their range and intensity at an alarming rate within recent years. Some ten or twelve years ago an Associate Committee of the National Research Council and the Dominion Department of Agriculture was organized to promote and support various phases of weed work, particularly surveys and research. In 1939, this committee was replaced by the National Weed Committee, sponsored by the National Advisory Council on Agricultural Services. The membership is drawn from all provinces and largely confined to persons in Dominion or Provincial Government services. Due to the impossibility of engaging a full-time secretary during the war, the committee has been unable to fulfill its legitimate functions. Last year, with the cooperation of the Massey-Harris Company, Limited, and the National Film Board, it produced a sound film, "Just Weeds," the chief purpose of which was to arouse public concern. This film has met with a warm reception, and we hope to produce others in the future.

Research and Experimentation

To a gathering of this kind, one does not need to labor the importance of this phase of the weed problem. While considerable research and experimentation has been done in Canada in the past, the greatest weakness has been the lack of a well-coordinated policy, in which all agencies were allocated their proper parts. Perhaps the sudden introduction of a product, such as 2,4-D and other herbicides may

serve to bring home the need of coordination in this field. The National Weed Committee would seem the logical medium through which weed research and experimentation should be coordinated.

Let me say that Canada has benefited, especially from the extensive research your country has carried out with a number of the deep-rooted persistent perennial weeds. With these weeds, of more recent introduction to this country, we are able to capitalize on your findings in applying tested and approved remedial measures, the value of which cannot be adequately measured.

Weed Surveys & Identification Services

Canadians have not overlooked the importance of this approach to the weed problem. For many years, through the Botany Division of the Federal Department of Agriculture, a continuous survey on weeds has been conducted and the results published from time to time. Seed grain drill surveys have been made from time to time in cooperation with Provincial authorities and have been particularly effective in "exposing" the seriousness of the contaminations in seed being sown by farmers. Through a well coordinated service in which the Dominion, Provinces, and private companies cooperate, every encouragement is given farmers, weed inspectors, and others, to have weeds identified. The response has been gratifying.

Education and Extension

In passing, I can say that much has been done, much remains to be done, in this limitless field. In recent years, most encouraging has been the readiness of private companies--especially those associated with the grain trade and implement business-to make funds available for this phase of the weed problem.

Weed Legislation

This falls under two divisions--one having to do with the trade in seeds of all kinds; the other mainly with seeds after they become established.

In Canada "The Seeds Act," administered by the Dominion Department of Agriculture, is a Dominion-wide law having complete authority over the handling of seeds of all kinds, both in inter-provincial trade and in the importation of seed. The trade in seed is therefore not the responsibility of the provinces. It is generally agreed that Canada has put her sights pretty high in the matter of seed, and is making a good job of administering this law which is one of the bulwarks of effective weed control.

High lights of the Seed Act are:

1. Canada is the only country to have a grading law--all seeds, (packet seed trade optional) are sold on a graded basis. This is in line with the grading of practically all other Canadian agricultural products.

2. The Control of Weed Seeds Very Stringent--rather than control on a percentage content of weed seeds, the basis is number of seeds per unit of weight.

3. Classification of Weeds Very Rigid--Noxious weeds come under four classes: prohibited (which includes the deep-rooted persistent perennials and dodder); primary; secondary; other noxious weeds.

4. Law Provides a Minimum of Germination

Cereals must germinate	60%
Forage seeds	65%
Vegetable seeds	30%

5. Registered Seed Purity Assured--Registration of seed comes under the jurisdiction of the Canadian Seed Growers Association--the producer's own organization. Through a cooperative arrangement, the Dominion Government acts as agent for the Association in field inspection, seed inspection, and sealing by Government Inspectors of all registered seed.

6. Illegal to Offer Other than Licensed Varieties for Sale--Only varieties that are licensed can be offered for sale in Canada.

7. Control Test Lacking for Seed-borne Diseases--Although the law does not call for this, facilities are nevertheless available for those wishing their seed tested for seed-borne diseases.

Weed Control & Eradication a Provincial Responsibility

Weeds, after they become established, pass from being a problem of the Federal Government to become the worry and the concern of the nine Provincial Governments. While each Province has a Noxious Weeds Act, this in the main is "enabling" or "delegated" legislation, as the major responsibility is passed on to the local unit of Government--the county, or municipality. These bodies are required to appoint weed inspectors whose duties are quite clearly set out. Theirs is the task to counsel or enforce, as necessary. In the final analysis, a great deal depends upon the type of person appointed to the office. I think in the years ahead, much more attention will have to be directed to selecting and training men to become capable and efficient Weed Inspectors.

Briefly, therefore, our work needs expansion and coordination. We do not wish to under-emphasize the good work that is being done; but, in honesty, we are bound to confess, that we are not doing enough.

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UNIFORM STATE SEED LAWS, WALTER DAVIDSON,
UNITED STATES DEPARTMENT OF AGRICULTURE

Mr. Chairman, ladies and gentlemen. At the banquet last night, when your excellent Toast Master started to do his quoting I felt like the darkie who had proceeded farther North than customary and wanted to work his way back to the home land. He became hungry, as we all do, and called from door-to-door for something to eat. As he worked his way back South, one morning he approached a door, as he had become accustomed to doing and timidly touched the bell. Someone came to the door and said, "You get around to the back door, you rascal." He did so, and muttered to himself, "Praise the Good Lord, I'se back home."

Some of you know that before going to Washington, I was with the State Seed Commissioner at Fargo and went to school there. So I feel very much at home in Minnesota.

I have asked Mr. Clark, if he will distribute to you, at this time, a mimeographed circular. This is in the nature of a summary, and might be useful later on, during your business session, and if not then, perhaps after you go back home.

At the time the Federal Seed Act of 1939 was being written, consideration was given to whether control over the dissemination in interstate commerce of noxious weed seeds, and seeds for planting purposes should be attempted, in accordance with specific Federal requirements, or on the basis of the many State requirements. In view of the necessity to recognize the factors involved on a state or regional basis, it was decided to leave to the states, the determination of the noxious seed restrictions. It was provided that seeds shipped into any state must comply with the noxious weed seed provisions of the law in that state. This was done, with knowledge of a wide range of opinion as to what constitutes a reasonable effort to control the dissemination of noxious-weed seeds. It was definitely the intention to encourage more uniformity.

There is a principle in law enforcement that the person subject to the law has a right to a clear statement of what is required by him by the law. For this reason, we undertook, in the administration of the Federal Seed Act, to prepare a publication entitled "State Noxious Weed Seed Requirements Recognized in the Administration of the Federal Seed Act." This was first published in 1940. Revisions have been necessary each year. The last revision will be distributed prior to January 1, 1946. It has not been easy in all instances to obtain a clear-cut statement of the noxious-weed seed requirements. In a few instances, regulations appeared in fact to be in conflict with the law under which they were being enforced.

The noxious-weed seed requirements in the seed laws of the many states have been arrived at by different methods. Weeds have been construed to be noxious due to the difficulty in separating the seed from crop seeds; to the effect of the seed on the commercial value of the crop; the difficulty of controlling the plants under field conditions; the prevalence of the plants in the State; and the fear of their

introduction from other States. In certain instances, it may be assumed that insufficient consideration has been given the practicability of the restrictions; whether seed was available with the degree of freedom from noxioux-weed seed required by the law, and whether it was possible to determine the absence of certain noxious-weed seeds, of their presence in small numbers. Comprehensive consideration of the recommendations of seed analysts, agronomists, seedsmen, farmers, and weed specialists has been needed. The absence of a generally accepted course to pursue in determining what should be considered noxious and what the restrictions should be, has quite naturally created confusion. Generally speaking, effective control has been frustrated.

The Uniform State Seed Law developed by the Association of Official Seed Analysts and the American Seed Trade Association and distributed in 1917 did not contain a definition of noxious weeds. The names of the noxious weeds were to be provided in the State Law, but no guide was provided, except that there should not be more than seven in number. In an effort to improve this, the Association of Official Seed Analysts adopted a definition of weed seeds in June, 1940. The definition was included in the Suggested Uniform State Seed Law that was distributed by the Department of Agriculture in September, 1940.

In 1942, a group of State officials in the Southeastern States met at Atlanta, Georgia, to study their noxious-weed seed requirements with a view to encouraging uniformity. This, we believe is the first step taken by a group of States to effect uniform noxious-weed seed requirements on a regional basis. Conferences were later held by Federal and State Seed Control Officials at a number of locations to discuss seed control problems. Among them, the lack of uniformity in noxious-weed seed requirements. Such a conference was held in 1944 at Salt Lake City in conjunction with the meeting of the Western Weed Control Conference. At these conferences the question of which weed seeds should be considered noxious was considered of secondary importance, to the principles that should be followed under seed laws in the control of noxious weeds. These conferences demonstrated that State seed officials everywhere are anxious to develop uniformity. We believe it is now possible to determine on a regional basis what noxious-weed seed restrictions are practicable under seed laws and what weeds should be included.

The Suggested Uniform State Seed Law contains a definition of primary noxious-weed seeds and secondary noxious-weed seeds, worded as follows:

"Noxious-weed seeds shall be divided into two classes, 'primary noxious-weed seeds' and 'secondary noxious-weed seeds' which are defined in (1) and (2) of this subsection.

(1) 'Primary noxious-weed seeds' are the seeds of perennial weeds, such as not only reproduce by seed, but also spread by underground roots or stems, and which, when established, are highly destructive and difficult to control in this State by ordinary good cultural practice.

(2) 'Secondary noxious-weed seeds' are the seeds of such weeds as are very objectionable in fields, lawns, or gardens of this State, but can be controlled by good cultural practices."

It has been suggested that the definitions of noxious-weed seeds be modified so that they would read as follows:

"Noxious-weed seeds shall be seeds that are disseminated in seed subject to this act, and shall be divided into two classes, 'primary noxious-weed seeds' and 'secondary noxious-weed seeds' which are defined in (1) and (2) below.

(1) 'Primary noxious-weed seeds' are the seeds of perennial weeds such as not only reproduce by seed, but also spread by underground roots and stems, and which, when established, are highly destructive, and are not controlled in this State by cultural practices commonly used.

(2) 'Secondary noxious-weed seeds' are the seeds of such weeds as are very objectionable in fields, lawns, and gardens in this State, and are difficult to control by cultural practices commonly used."

These modifications have the effect of restricting the noxious-weeds to those more difficult to control as a growing plant by cultural practices commonly used.

The suggested law provides that the sale of seed containing primary noxious-weed seeds should be prohibited subject to certain tolerances. It is provided that

the presence of secondary noxious-weed seeds in excess of certain rates shall be indicated on the label.

We hold to the view that weed control is a problem that rests primarily with the farmer, but that he should be assisted under law, insofar as it seems necessary and is practicable to do so. It would be of assistance if seed laws prevented the dissemination of extremely harmful noxious-weed seeds and informed buyers in all instances where seed contains noxious-weed seeds. As you know, however, the methods of seed testing cannot determine accurately whether noxious-weed seeds are absent or present in small quantities. There is a limitation, therefore, to the efficacy, of even the best efforts to prevent the dissemination of noxious-weed seeds in seed-trade channels. The outright prohibition against the sale of seed containing noxious-weed seeds should be considered objectively in the light of its practicability. The severity of this requirement suggests the need to confine it to those seeds and under those circumstances where it may be considered a practical necessity, and where these extreme efforts would not be defeated through uncontrolled dissemination of the same kind of seed by other means.

The Suggested Uniform State Seed Law provides that the name and number per ounce and the name and number per pound of secondary noxious-weed seeds shall be shown upon the label, if they are present at a rate in excess of 1 in 5 grams, 10 grams, 25 grams, and 100 grams of the different crop seeds grouped in accordance with their size and weight. This permits the presence of rather substantial quantities of noxious weed seeds, without requiring that their presence be shown upon the label. This has been referred to as a tolerance but it permits the presence, without showing it on the label, of from two to five times as many noxious-weed seeds per unit weight as would be permitted by the tolerances recognized in the administration of the Federal Seed Act.

In line with our view that the seed buyer has a right to be informed when noxious-weed seeds are present, we believe that State seed laws and the Suggested Uniform State Seed Law should require the person who sells seed to show on the labels the rate of occurrence of secondary noxious-weed seeds when he finds them present, regardless of the rate of occurrence. Tolerances are already recognized to protect from unjust accusation the person who, despite his efforts, did not find the noxious-weed seeds that were present. The provision in the Uniform State Seed Law that requires labeling to show the presence of noxious-weed seeds when in excess of a certain rate has the effect of providing an additional tolerance. This additional tolerance is not consistent with that needed to protect one from the variations in the results of a seed tests.

A study of recently enacted State Seed Laws indicates that the noxious-weed seed requirement may be broken down into five distinct categories presented in the order of their apparent severity, as follows, the most severe being first:

1. Prohibits the sale of seed containing any of certain noxious-weed seeds considered primary.

2. Prohibits the sale of seed containing certain primary noxious-weed seeds in excess of a rate, such as 1 in 5 grams, etc., or 200 or 500 per lb., etc.

3. Prohibits the sale of seed containing certain secondary noxious-weed seeds in excess of a given rate.

4. A requirement that the labels show the name and number per ounce or pound, if the seed contains any of the applicable noxious-weed seeds.

5. A requirement that the labels show the name and number per ounce or pound if the seed contains the applicable noxious-weed seeds, at a rate in excess of 1 in 5 grams, etc.

It will be noted that the noxious-weed seed requirements in the Suggested Uniform State Seed Law includes (1) and (5) above. In other words, the suggested requirements are the two extremes. Several of the States have departed from their suggestions. If the reason for the departure is determined, the suggested law may be improved. The failure to follow (1) may be due to impractibility of enforcement after including too many species as primary noxious. Failure to follow (5) may be due to the fact that it conceals the presence of noxious-weed seeds present in small numbers. With this in mind, the list of noxious-weed seeds that we are proposing on a regional basis is submitted with the assumption that the primary noxious-weed seeds will be restricted in number of species and will be subject to the requirements in paragraph (1) and that secondary noxious-weed seeds will be subject to the require-

ments in Paragraph (4). This has the tendency to increase the severity, but this seems consistent if the list of noxious-weed seeds is confined to those that fully comply with the definitions.

The regions and the list of weeds are proposed for consideration by the State officials. If agreement can be reached, we should like to lend our efforts to bring about the adoption on a regional basis of uniform noxious-weed requirements.

We feel that it is important to coordinate the noxious-weed seed requirements in State and Federal seed laws with the efforts made by other means to reduce the harm done by injurious weeds. The Weed Control Conference should contribute to this end.

We would welcome any criticism or assistance by other means that your conference may lend toward the adoption of Uniform noxious-weed seed restrictions on a regional basis. Thank you, very much.

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MR. NOEL HANSON, CHAIRMAN: I believe that there are now several Committees ready to report at this time. Mr. Kinch? Will report for the Committee on Uniform State Seed and Weed Laws.

REPORT OF COMMITTEE ON UNIFORM STATE WEED AND SEED LAWS, R. C. KINCH

Mr. Chairman, ladies and gentlemen. I would like to say before I start on this report of the committee that the committee concerns itself only with State weed laws. We did not concern ourselves with the seed laws.

Because of the very limited time available for the work by this committee before the conference, it was decided to make a study of the leading or important subjects in the states making up this organization. With some information on weeds of this region available, it would then be possible for the states to coordinate and unify their weed control and eradication programs.

An attempt was made to gather some information about weeds of the North Central Region, that now are, or are capable of becoming distinct threats to agriculture. This information was obtained by sending a questionnaire to either an agronomist or botanist of each of the thirteen states in this region, having him list and rate the ten weeds in his state that are causing or have the potential to cause, the greatest agronomic losses.

To gather more information about weeds but from a different viewpoint, a similar questionnaire was sent to the seed analysts of this region, asking them to also list and rate the ten most serious weeds of their respective states.

Other information about the kinds of weeds listed in weed eradication and seed laws of the thirteen states was also gathered.

The information thus gathered was summarized and is presented in tabulated form on the sheets that were passed out.

A few general comments on this data may be of interest.

1. In all four tabulations bindweed is, without doubt, the king of weeds in this region. Canada thistle also definitely seems to be in second place.

2. After the first two weeds, the unanimity of opinion sharply drops.

3. Surprising as it may seem, there was complete agreement between the agronomists and botanists with one viewpoint as to the ten most serious weeds of this region.

4. One annual weed, dodder, appeared in both lists of the first ten most serious weeds.

5. Johnson grass, while appearing in only six of the southern states, was rated high on the list when even mentioned. Also, while listed as a very serious weed, only one state had it listed on a weed eradication law.

6. Many weeds listed in the weed eradication laws would be difficult to justify on actual economic losses.

The Committee on Uniform State Seed Laws Recommends.....

I

The Committee on Uniform State Weed Laws recognizes the fact that weeds in the states of the North Central Weed Control Conference have varying degrees of severity. For the purpose of preventing the spread of harmful species, and to form a basis for research, education, eradication and enforcement programs:

THIS COMMITTEE RECOMMENDS that noxious weeds be recognized by the definition....

1. Primary noxious weeds--are weeds that reproduce by seed and by underground stems or running root systems, which, when established, are causing or capable of causing the greatest losses to crop production, and cannot be controlled or eradicated, except by special cultural methods approved by the experiment station.

2 Secondary noxious weeds--are weeds that are very objectionable and difficult to control.

II

The Committee on Uniform State Weed Laws RECOMMENDS to the North Central States Weed Control Conference that the President appoint a committee to study the noxious weed problem of these North Central States and to formulate plans and suggestions of unifying as much as possible their weed control and eradication activities.

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MR. KINCH: I move the adoption of this Report. - - - Seconded by Dr. Worzella, and carried.

REPORT OF COMMITTEE ON FEDERAL LEGISLATION TO CONTROL INTERSTATE MOVEMENT OF FEED, SEED, AND OTHER INFESTED MATERIALS, C. H. SCHRADER, CHIEF WEED AND SEED DIVISION OF MINNESOTA

Mr. Chairman, and friends. The duties assigned to this Committee are "to work on the problem of securing Federal Legislation to restric the interstate movement of weed-infested materials."

The importation of weeds into our states by means of weed seeds or other propogating parts of plants, which infest such materials as seed, feed, hay, straw, nursery stock, packing materials, etc., from other states and foreign countries, has long been a problem facing all states, and has become a serious, urgent, and active concern of many states.

Most states are alert to the fact that large amounts of new and of old weeds are coming across their borders to infest new and far-flung weed-free areas and also to further augment present infestations which are just starting, or have already reached serious dimensions.

Weeds have a way of gradually creeping up on us and when we become actively aware of their presence, they are too often established firmly enough to cause much loss of crops, and tremendous cost for their control.

Practically every state has a law governing the sale of agricultural seeds. Not many of these laws deal directly with, or attempt to regulate or to prevent the importation of weed infested seed. Their main purpose has been to deal with seeds and to regulate the sale, distribution, and use of weed-infested seeds after they have entered the state. Such states, irrespective of the excellency of their laws and their enforcement were not very successful in a direct way in protecting themselves against importations of noxious weed seeds before the present Federal Seed Act became operative. This act is about as effective as the standards and the enforcement machinery and efforts in the various states, and the active cooperation which the states give the Federal Government in its enforcement.

Few states have laws governing the sale, transportation, and importation of weed-infested materials, other than seeds. In a number of states, the nursery and pest laws cover importation of noxious weed and weed seeds along with other pests in nursery stock.

Your committee has examined the laws dealing with material infested with, and which are possible carriers of weed seeds and other viable propogating parts in 27 states, including 22 states West of the Mississippi River, and the five states East of the River (Ohio, Indiana, Illinois, Michigan, and Wisconsin) which are members of this conference. A number of these 27 states, among them, California, Kansas, Montana, Utah, and Wyoming, regulate by laws, the importation of other materials than seeds and nursery stock which are infested with noxious weeds. How effective these laws are, your Committee has no way of knowing. This leaves about 22 of the 27 states with no laws directly covering the importation of weeds and their seeds in such materials as whole grains, hay, straw forage, bedding, manure, etc. Ten states have prohibitions against weeds or noxious weeds in mill feed unless the vitality of the weed seeds has been destroyed by grinding or otherwise. Sixteen of the states do not mention weed seeds in their feed laws, neither does the Federal Feed Law, the Federal Food, Drug, and Cosmetic Act, mention weed seeds.

Your committee has been advised that grinding of screenings is not a dependable way of destroying the viability of weed seeds. There is need for some real and definite research on this subject.

The Federal Seed Act permits the importation of screenings of wheat, oats, rye, barley, buckwheat, field corn, field peas, and field beans for processing and permits the shipment of screenings of any kind in interstate commerce for processing. This is done on the assumption that griiding, or other processing of the screenings will devitalize the weed seeds therein. Thus, it is seen that in addition to agricultural and vegetable seeds, feeds, and nursery stock in the importation of which there is more or less state and federal protection, there is a large group of products which are carriers, and distributors of noxious weed seeds, which in most cases are not covered in many states by either state or federal laws.

Whole grains and commercial chick scratch feeds, screenings, hay, straw, fertilizer, nursery stock, packing for plants, and manufacturers goods in transit are often heavy carriers of weed seeds.

Government wheat and other grains and seeds, hay, and forage often carry considerable quantities of more harmful weed seeds. Too often the distributing officials have been unaware of the presence of weed seeds, or they have been more or less indifferent to the requests and pleas of farmers, county agents, and other local, county, and state officials that such materials be properly cleaned before distributing them.

For example, in one state, in 1942, the weed and seed officials were asked by county agents, farmers, and others, to investigate complaints that federal commodity credit corporation wheat, being distributed in the state for feed, was infested with noxious weeds. After some difficulty, samples of 449 cars of this wheat were secured. Upon analysis, these were found to contain:

1. Average weed-seed content--61 percent.
2. Average of 15 kinds of weed seeds per car.
3. 333 cars contained quack grass at average rates of 13.4 seeds per pound of wheat.
4. Forty-five cars contained field bindweed (creeping Jennie) at average rate of 1.8 seeds per pound of wheat.
5. One car contained leafy spurge seed at rate of 2 seeds per pound of wheat.
6. Three cars contained sow thistle seed--one seed per pound of wheat.
7. Twenty-one cars contained Canada thistle seed--1.3 per pound of wheat.

How many of these weed seeds would have passed through all the operations of handling, feeding and manuring, and reached the field alive and able to produce plants is problematical, but it is easy to believe that enough could survive to infest a farm seriously.

Much criticism of the officials responsible for distributing this grain resulted and an attempt to stop its distribution until it was properly cleaned, was not very successful, because the state had no law regulating such material, and the distributing officials were not concerned with the weed seed in the wheat. Perhaps the danger of weed infestations from this source is not as great as it is claimed to be. The fact that the government was distributing the wheat may have served to magnify the danger in the eyes of many people. Many of us heard about this weedy government wheat. It is well known that many of our worst weeds are being distributed from farm to farm throughout our states by whole grains for feeding and planting with no particular concern as to its noxious weed content. Nevertheless, wheat and other grains distributed by the Federal and State governments for feeding and seeding

should conform to state requirements as to weed content, just as should grain sold from farm to farm or elevator to farm be weed free. We can hardly expect the federal government and the states, when they distribute grains, feed, and forage, to conform to standards of purity and freedom from noxious weed seeds which are not required of commercial and local sellers and distributors of such materials and are not required of the state government when they distribute such materials.

Locally-grown grains do not bring new weeds into a community, although they do a good job of distributing them once they are introduced. One state's experience served to focus attention on the danger of weed infestation from whole grains, both locally grown and imported. Partly, as a result of this situation, and from the efforts of a commissioner of agriculture, and others, a bill (H.R. 1396) was introduced into Congress in 1943 to require that seeds, livestock and poultry feed, nursery stock, fertilizer, or soil conditioning materials distributed to farmers by the U. S. Government shall be subject to state laws where the distribution is made. This bill passed the House May 17, 1943, was introduced into the Senate May 19, and passed, but was vetoed by the President.

January 13, 1941, a Federal Noxious Weed Control Bill (H.R. 2086) was introduced into Congress. It was to regulate the importation into the United States and transportation in interstate commerce, of any feed, grain, or seed screenings, grains, hay, bedding, packing material, or other material containing live noxious weed seeds, unless it is stated on the label or invoice that shipment is intended for processing, cleaning, or manufacturing purposes, or the materials complies as to its noxious weed seed content with the law of the state into which it is to be transported. It appears that this bill was never voted out of the committee on agriculture.

On May 26, 1945, another bill was introduced into the National House of Representatives to provide that the several states shall continue effective measures of control and protection against the importation, introduction, and spread of noxious weeds, together with many other pests, and to guarantee that purchasers or recipients of seeds, livestock, and poultry feeds, nursery stocks, fertilizers, and other agricultural chemicals shall have the protection guaranteed them under the laws enacted by the several states. This bill covers only materials distributed by any department or agency of the United States. We were advised by a Congressman, September 27, 1945, that the bill was reported by the committee and was on the House calendar. If we desire such federal laws, it appears that the only thing we have to do is to get behind them through our members of Congress. We understand that none of these bills has had the support of the U. S. Department of Agriculture.

These three bills cover two very important and separate weaknesses in our Federal State Weed Control relationships. One bill requires only that all noxious weed infested materials sold or bartered or distributed by the Federal Government shall comply with all laws of the several states regulating the sale, bartering, and distribution of such materials. The other bill requires the Federal Government to give the states the same Federal regulations of, and protection from all materials transported in interstate commerce, that the states exercise over materials sold and transported intrastate, that is within the borders of the state. These two propositions could probably be readily combined into one bill.

Your committee, after consideration of the great importance of this problem, and the difficulties of its solution, submits, as a proper approach to a solution, some recommendations that are embodied in a set of resolutions.

Your committee does not believe that enactment of the suggested laws will automatically or promptly solve the problem, but we believe that laws, both state and federal, should be enacted which, by working together, will enable those states which are interested, to obtain some adequate measure of protection from spread of weeds by all kinds of materials, infested with weed seeds and other propogating plant parts.

I move the adoption of this report. -- Seconded by Mr. Erickson, and carried.

MR. SCHRADER: The Committee has prepared some Resolutions for consideration.

WHEREA , there is need for both tate and Federal legislation regulating the sale and use, and the interstate and intrastate transportation of grains, screenings, and all other important weed infested materials, not adequately covered by present State and Federal Laws:

THEREFORE, BE IT RESOLVED THAT:

1. A uniform law be drafted, covering the more important and general needs of legislation by the several states, covering the sale, transportation, and use of weed seed and weed plant infested materials in both interstate and intrastate commerce.

2. The interested states enact suitable laws as nearly like the uniform law as possible, to meet their state-wide conditions.

3. A Federal law be enacted, giving the states protection in the importation and interstate transportation of weed infested materials of all kinds, in accordance with the provisions of the laws of the several states.

4. We urge, through our proper members of Congress and others, the passage of the Flannagan Bill (H.R. 3321) now on the calendar of the House of Representatives, and the enactment of another law covering the phases of this problem not included in the Flannagan Bill.

5. A draft of the Uniform Law and of these Resolutions be sent by the conference, to the governors, commissioners of agriculture, deans of the agricultural colleges, and other interested and influential organizations, and persons of the several states, requesting them to memorialize their members of their state legislature to enact the needed state legislation and to memorialize the President of the United States, the Secretary of Agriculture, and the members of Congress to enact or support the enactment of the needed Federal Legislation.

I move the adoption of these Resolutions. - - - Seconded by Dr. Willard and carried.

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REPORT ON SURPLUS WAR EQUIPMENT FOR WEED CONTROL
W. L. KLATT, State Weed Supervisor from Lincoln, Nebraska

The Report of the Committee on Surplus War Equipment is very brief. I attempted to secure the information as to the availability of the different types of equipment through the surplus reported, and publications from the Treasury Department.

It may be, that interest in surplus war equipment for weed work was a little untimely, as it seems that the disposal of such goods is rapidly expanding at such time, and that the program is being reorganized to operate more effectively.

Recently, the disposal of surplus war goods was transferred from the United States Treasury Department to the Department of Commerce.

It appeared up to this time that very little equipment was available, which could have been adapted to weed control and weed eradication activities. Trucks were in such bad condition that there was hesitation in their purchase. Now they appear to be in better condition, and new equipment is also available.

There has been some interest in Nebraska in the listing of some 4-wheel drive units, such as jeeps, for weed eradication. I believe in the future, as more war equipment becomes available, and as the needs for weed work are better known, a better interest for surplus war goods will develop.

At the present time, all Federal, State, and local government and tax-supporting institutions have priority for the purchase of surplus war equipment. Government agencies are accorded priority over State and local Government.

Regarding the purchase of surplus property, information may be secured from the Department of Commerce, Office of Surplus Properties, Cincinnati, Ohio, Chicago, Illinois, and Kansas City, Mo.

I move the adoption of this Report. - - - Seconded by Dr. Stahler, and carried.

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MR. HANSON; The next Committee is on Movement and Sale of Weed Infested Materials by Federal Agencies, under the Chairmanship of Mr. Leonard, and due to his untimely death, nothing has been done on that Committee. I think the activity of that Committee has been covered by the Committee that Mr. Schrader has reported for.

Is there any discussion at this time as to a need for the continuation of this Committee, or possibly a motion in order to discontinue such a committee.

MR. YOST: It seems to me that that is a very important problem whenever it exists. I know there was a time in our State, I think that I mentioned it in my opening paper, when Federal agencies did sell a large amount of material, infested and otherwise, in our state.

It was an important problem at that time. However, I think during the past couple of years, there has been little, if any, movement or sale of grain through federal agencies. I could be mistaken, but if that problem is not in existence at the present time, it seems to me that we could discontinue that committee until the problem further arises. I make a motion, at this time, that this committee be discontinued. (Seconded by Dr. Zahnley)

DR. WORZELLA: I think the Committee headed by Mr. Schrader has taken up that point. Maybe it could be combined with another Committee. I think it is a problem--maybe not today--but if such legislation is not in effect, and if we have a lot of wheat moving and we make movements of wheat, grain, or other materials, I think we should be ready for them. I would make the suggestion that that particular phase be combined with the Committee working with Federal Legislation of Interstate Movement Material.

MR. YOST: Of course, the matter of selling materials by Federal Agencies is not necessarily Interstate, but it could be combined with the other Committee, and I am in agreement with having my motion revised to that effect.

MR. HANSON: Professor Zahnley, is that all right with you?

DR. ZAHNLEY: Yes.

MR. HANSON: Any further discussion? (Motion carried)

REPORT ON FEDERAL EXTENSION WEED SPECIALISTS, E. P. SYWESTER. IOWA

Mr. Chairman, ladies and gentlemen. I would like to have this Report considered primarily as a progress report.

This committee was appointed by the president of the organization, and if it had not been for the excellent cooperation of all members of the Committee, we probably would not have gotten very far.

The correspondence which started sometime this summer, was carried on entirely by mail, and it was only due to the very good cooperation of all members of the committee that we did make some progress.

The members of the committee were George Briggs of Wisconsin, Mr. Smith of Nebraska, Mr. Norgaard of Brookings, S. Dakota, and Mr. Brokaw from Nebraska. The Committee met at the Hotel Lowry on the Afternoon of November 26, and upon motion that we have a Secretary, Mr. U. J Norgaard of South Dakota was elected the Secretary. We did have two other members of the Committee appointed, Mr. Lee of Indiana and Mr. Jensen of North Dakota, who were unable to be present, and upon the motion of Mr. George Briggs, the following men were added to the Committee:

Ralph F. Crim, Extension Agronomist, St. Paul
M. L. Armour, Extension Agronomist, St. Paul
E. E. Sanderson, Extension Agronomist, Brookings, S.D.

We are also indebted to the following people, who were in the room at the time and helped our meeting:

H. E. Wood, Weeds Commissioner, Dept. of Agriculture, Manitoba, Canada
George Knowles, Agronomist, Experiment Station, Ottawa, Canada
A. W. Wilson, Provincial Dept. of Agriculture, Alberta, Canada
Ralph D. Mercer, Extension Agronomist, Bozeman, Montana
Ken Miles, Wm. T. Thompson Co., Los Angeles, Calif.
E. Robertson, Line Elevator Farm Serv., Winnipeg, Man.

The Chairman explained to the group, since there were quite a few new members present, that the primary purpose of the committee is to study the possibility of obtaining additional services and personnel on both state and national levels to the end of achieving a more effective weed control program

The chairman further outlined the activities on the 1945 committees, as appointed by President Yost. He stated that during the summer of 1945 he had written to the

members of the committee concerning the problem of securing additional Federal weed specialists. All members replied to his letter, and as a result, he had written a letter about the problem to Dr. Milton Eisenhower, of Kansas State College, who had been named as chairman of a committee to direct the study of the reorganization of the United States Department of Agriculture. It was pointed out by Dr. Eisenhower that it would be of great assistance to the states to have additional federal funds and personnel on the weed projects. The activities of the committee were discussed to some length.

Visiting delegates from Canada made valuable contributions to the discussions by explaining how the Canadian Department of Agriculture cooperates with the educational and regulatory services in the Provinces.

Ralph Mercer of Montana, who is a member of the Western States Weed Control organization, called attention to the importance of developing strong state, county and community leadership in the weed control program.

After due consideration of the problems connected with educational activities, it was suggested that, since such problems were of special concern to the Directors of Extension, these should be considered by said directors.

George M. Briggs, voicing the concensus of the committee discussion, made a motion that the secretary and chairman of the committee write a letter to the Directors of Extension of the thirteen states represented at the North Central States Weed Control Conference, requesting that the Directors meet in special session with representatives of the Extension Committee to study the specific means and methods on how extension can best fulfill its responsibilities in the weed program, and especially to make recommendations as to how essential funds and personnel can be provided to work out action programs in the various state and counties.

The motion was seconded by Ralph Crim, and was carried.

The committee commended the work which has already been done in research in weed control, and accepted the general proposition that enough information is available on weed control so that a practical and effective weed control can be carried out. However, this situation does not suggest that more information and research is not urgently needed for the extension program. The committee strongly suggests that continued research, and more attention be given to the control of annual weeds.

A motion was made by George Briggs that the chairman of this Committee contact the policy committee in regard to the discussions of research which were made by the extension committee. The motion was seconded by Loys Smith and carried. I have contacted Dr. Willard and the policy committee has taken care of this in their recommendations.

I think that a great portion of the success of this report is due to the untiring work of Mr. Norgaard, as Secretary.

Mr. Chairman, I move the adoption of this report. --- Seconded by Dr. Worzella, and carried.

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MR. HANSON: That completes that series of reports by Committees. I am going to turn the meeting back to Mr. Yost.

MR. YOST: Thank you, Noel. As you can see from your program, we have gotten down to the closing session, which will consist mainly of some business matters.

The question of how to handle the committee reports and of having an over-all committee to consider the reports was settled by deciding that each committee take care of its own recommendations and resolutions.

The next order of business was the selection of the meeting place for next year, and to entertain any invitation as to where the meeting should be held next year.

MR. SPRY: We would like to extend an invitation to the next session of the Converence to be held some place in Iowa in 1946.

It was voted to hold the 1946 meeting in Iowa.

MR. SPRY: Inasmuch as we selected Iowa, we would like to extend an invitation to all the people who have been here this year, and especially from Canada and

from the Western Conference, and of course, all members of the North Central States Weed Control Conference.

PRESIDENT YOST: You will note from your program that we have listed the question, "Shall the Conference Accept Commercial Memberships from Commercial Concerns?" That subject is open for discussion at this time. You have heard what Mr. Ball said about what the Western Conference has done. We have had a splendid turn-out, and they added a lot to the meeting. What do you gentlemen think about accepting Commercial memberships?

DR. BAKKE: You have heard what Mr. Ball said about the acceptance of commercial membership and I think he presented the argument in good form. We are of the opinion that we should, and I move that we accept the commercial memberships in our organization.

(Motion seconded by Mr. Frear of Minneapolis)

PRESIDENT YOST: Any discussion?

DR. WILLARD: I would like to ask the makers of the motion on what basis and under what conditions they propose to do that?

DR. BAKKE: I believe that we could include the manufacturing companies that manufacture material that we are concerned or interested in, and would not include the retail dealers.

DR. WILLARD: Should it include dues or not?

PRESIDENT YOST: Should it include dues, and would they have the voting right?

MR. BRIGGS: I think it might be well to read from last year's Proceedings in regard to voting.

MR. HANSON: Mr. Chairman, I was just going to ask for the floor on this. According to action taken by us last year, the following are considered members of the conference:

"(a) Employees of the state departments in charge of weed and seed regulatory and control programs, including directors of such state departments;
(b) Weed research workers and extension and other educational workers engaged in weed control, connected with state colleges, universities and experiment stations, or the Federal Government;
(c) Representatives of commercial concerns, manufacturing or selling herbicides or equipment used in weed eradication, or engaged in seed merchandising;
(d) Others interested in weed control."

MR. SCHRADER: Does that include Extension, too?

MR. HANSON: Classification "b" reads "Weed Research workers and extension and other educational workers engaged in weed control, connected with state colleges, universities and experiment stations, or the Federal Government."

Dr. Bakke: That would include all the County Agents

MR. HANSON: As extension workers, I believe that is right. It would include other educational workers, as well. Anyone engaged in teaching classes in weed control in colleges, for instance, or any teaching personnel that does any teaching in weed control would be included.

MR. SCHRADER: How about the Smith-Hughes set-up?

MR. HANSON: I imagine an interpretation would be necessary in some sort, if they are engaged in weed control activities. They probably wouldn't be engaged in weed control activities as a major portion of their time, and as a basis of that interpretation the conference should have some understanding.

MR. SWENSON, MINNESOTA: I note that the next thing on the program is "Shall the Conference Have a Constitution and By-Laws?" I make a motion that the President appoint a Committee of five to submit a Constitution of By-Laws and that these questions be clarified at the next meeting, as we see fit.

PRESIDENT YOST: There is a motion that the President appoint a committee to draft a Constitution and By-Laws. I am wondering if that will solve our previous question about memberships?

MR. SWENSON: Probably it isn't answering it as of today, but it will be answered, after due consideration, with plenty of time to study the question. It will be answered in the Constitution next year, and presented to the Annual Conference.

PRESIDENT YOST: Is that your wish, or do some of you think that you want to collect membership fees during the coming year?

MR. BRUNS: I believe there is a motion before the house.

DR. BAKKE: If that is all taken care of by what we voted on at the Omaha Meeting, my motion is out of order.

PRESIDENT YOST: I believe that the Commercial concerns, according to the ruling last year, are members. Are we satisfied on that, or do you want to go any further into the matter of setting a membership fee.

MR. TIMMONS: I was wondering what are the dues, etc., if they are members.

PRESIDENT YOST: Perhaps we could have a motion on that so that we can discuss it a little better.

MR. SPRY: I make a motion that the commercial concerns continue a membership as an associate membership, without dues at the present time.

(Seconded by Dr. Stahler)

DR. STAHLER: I happened to be on that Committee when we drew up the regulations and set the dues, and the understanding was that that was to prevail until we had a Constitution and By-Laws. I think that insofar as Mr. Swensen already had a motion before the house, I will second that motion. That is the same topic that we had last year. We had quite a bit of discussion, and the regulations were to take care of that until we had the Constitution and By-Laws!

DR. BAKKE: I will withdraw my motion, so that we can act on Mr. Swensen's motion to hold this question until we have our Constitution and By-Laws.

PRESIDENT YOST: We will accept your withdrawal. Is there any discussion on Mr. Swensen's motion? We will, then, vote on the motion that the Chair appoint a Committee to draft the Constitution and By-Laws and make their report at next year's meeting. (Motion carried).

At this time, I want to ask for a report from the States on who your representatives are to be for the coming year?

ILLINOIS:	Mr. Keltner
INDIANA:	Mr. Lee
ICWA:	Mr. Spry
KANSAS:	Professor Zahnley
MICHIGAN:	Mr. Stahl
MISSOURI:	Mr. Kuhler
MINNESOTA:	(Mr. Schrader informed Chair no-one had been selected, as yet.) Mr. Schrader later selected.
NEBRASKA:	Mr. Klatt
NORTH DAKOTA:	Mr. Stoa
OHIO:	Dr. Willard
OKLAHOMA:	Mr. Bower
SOUTH DAKOTA:	Dr. Worzella
WISCONSIN:	Mr. Lunz

MR. TIMMONS: I would like to make a motion regarding sending a delegate to the Western Conference. Mr. Ball's expenses are paid by the Conference, and they would probably appreciate our sending an official representative to their Conference to be held in February. I move that an official representative of this conference be designated to attend the Western States' Meeting, in 1946, and that his expenses be paid by this Conference.

(Seconded by Mr. Klatt of Nebraska and carried)

DR. STAHLER: Following that motion, I suggest that we send our able President, Mr. Yost, to that meeting.

(Seconded by Mr. Larson.)

PRESIDENT YOST: I want to assure you that it would be a big pleasure for me to attend, but I would like to say that I would be very glad to have anyone else attend. I am not sure that I can go. I am spending quite a little time out of the state, and perhaps our work has had to suffer a little. I would be very glad to have anyone else attend, if it could be left up to the Executive Committee, or the Officers to select that delegate, that would suit me.

DR. STAHLER: To save my embarassment, may I put my motion to the vote of the group. (Passed unanimously)

PRESIDENT YOST: I still can't promise to attend, but if I am unable, I assure you that the officials will select a competent delegate to attend the Western Conference.

MR. HANSON: Mr. Chairman, probably one thing that needs clarifying, and probably it does not, but I am wondering if the State Representatives constitute a quorum for which we can conduct the business of the conference. Is that a matter that should be considered?

PRESIDENT YOST: It hasn't been discussed.

MR. HANSON: Probably those State Representatives could be considered as a Board of Directors. They don't have to be designated as such, but if a quorum of the State Representatives were present in any meeting at any time, it might be possible to conduct some business of the Conference that might come up and it might facilitate some things that would have to wait until the Annual Meeting, otherwise. I am not putting a motion here, but just opening this up for discussion.

PRESIDENT YOST: If I am wrong, I would be glad to be corrected, but I presumed that the officers were unable to attend the conference, then they would have the authority to select a delegate.

MR. FREAR: I move that in case the President is unable to attend the Conference, that the Executive Board pick someone to go in his place.

(Seconded by Dr. Willard and carried.)

REPORT OF COMMITTEE ON RESOLUTIONS, BERNARD C. SWENSON,
Deputy Commissioner, Department of Agriculture, Dairy and Food, from
the State of Minnesota

Mr. Chairman and gentlemen of the Conference. The Committee on Resolutions offers the following Report.

1.

FORWARD

The North Central States Weed Control Conference assembled at Saint Paul, Minnesota, November 26, 27, and 28, 1945, re-dedicates itself to a fuller realization of the purpose for which it was established.

11.

Realizing the significance and importance of science and research in all of the fields of human endeavor, we are especially cognizant of the need of concerted effort on a national level in augmenting and prosecuting a vigorous research program for the study of plant habits and control measures, with particular emphasis on the newly developed herbicides. The constant increase and wide distribution of weeds constitute a real menace to agriculture in all sections of the United States.

In order that a more effective program of research be initiated on a national level, we urge the Congress of the United States to make available to the U. S. Department of Agriculture the necessary funds to establish and maintain within the said Federal Department and within its Bureau of Plant Industry a separate and distinct division for weed research.

Regulation Relative to Distribution of Feeds, Fertilizers, and Nursery Stocks by Agencies of the United States.

A survey of the varieties of noxious weeds now prevalent throughout all of the agricultural areas of the United States indicates that most of these weeds are not native American plants, but have been introduced largely through the efforts of man, and, particularly, through the distribution of seeds and of livestock feeds. During recent years, large quantities of feeds and seeds have been distributed by federal agencies throughout the several agricultural states in violation of state laws regulating the movement and distribution of feeds and seeds. An analysis of 449 cars of wheat distributed in one state alone, indicated the presence of noxious and primary noxious weeds in varying degrees as follows:

Average percentage of weed seeds in 449 cars.....0.61%
Average number of kind of weeds per car.....14.7
Total number of cars having quack grass.....333
Average number of quack grass seeds per pound in each car.....13.4
Total number of cars having Field Bindweed.....45
Average number of Field Bindweed seeds per pound per car..... 1.8
Total number of cars having Leafy Spurge..... 1
Average number of Leafy Spurge seeds per pound per car..... 2
Total number of cars having perennial Sow Thistle.... 3
Average number of Perennial Sow Thistle Per pound per car..... 1
Total number of cars having Canada Thistle.....21
Average number of Canada Thistle seeds per pound per car..... 1.3

It is the concensus of this conference that H.R. 3321, of which Mr. Flannigan, Chairman of the House Agricultural Committee is the author, should be immediately passed by the Congress, so as to curb this potent source of reinfestation of noxious weeds.

IV.

State Laws Regulating Distribution of Animal Feeds

We recommend that legislation be enacted by the several states concerning the sale and distribution of all grains and concentrated commercial feeding stuffs used for feeding farm livestock, prohibiting the sale and distribution of such feeds which contain noxious weed seeds in which the viability has not been destroyed.

We further recommend that this legislation can be most easily and effectively obtained by amending existing feed control laws in those states having such laws.

V.

Adequate Weed and Seed Control Legislation by States

Although most states now have legislation regulating the distribution of seeds and control of noxious weeds, it is realized that many of the state laws, as they now exist, are entirely inadequate in meeting present day problems of seed distribution and weed control.

We recommend, therefore, that existing laws be reviewed and the need for additional legislation or amendment of existing laws be studied by weed and seed control officials in each of the states that are now members of the North Central States Weed Control Conference.

We further recommend that the president of this Association for the ensuing year, continue the committee to study and recommend to the several states, means of unifying the State weed and seed laws.

VI.

Need for Revision of State Laws Regulating Economic Poisons

With the development and introduction of large numbers of new products for destroying, repelling, or mitigating insects, rodents, fungi (including bacteria, weeds, and other forms of plant or animal life, it is recognized that in many instances, existing state laws regulating the use of these "economic poisons" are both obsolete and inadequate in meeting present-day requirements for the control, use, and distribution of these materials.

It is recommended, therefore, that the several state departments of agriculture of the group of states included in the North Central States Weed Control Conference give immediate consideration to either revising their present laws, or repealing them and rewriting in their entirety their statutes governing economic poisons.

We further recommend that the president of this organization, for the ensuing year, appoint a special committee to serve as liaison officers between the several commissioners of agriculture for the purpose of obtaining, so far as possible, uniform legislation on this subject by the several states.

VII.

Use of the Term 2,4-D

It is the sense of this Conference, that it is undesirable to refer to 2,4-dichlorphenoxyacetic acid and similar products as hormones in articles, directions, or advertising, since they are not, in fact, hormones.

VIII.

In Memorian

The Conference notes with sorrow and regret the recent death of two active workers in weed control in this region, Dr. R. B. Harvey of the University of Minnesota, and Commissioner Leonard of the Illinois State Department of Agriculture.

IX.

In Appreciation

The members of the various organizations, commercial interests, and states representated at the North Central States Weed Control Conference, assembled in Saint Paul, Minnesota, November 26, 27, and 28, 1945, express our appreciation to:

1. The workers of the United States Department of Agriculture.

2. The donors to this annual convention of the North Central States Weed Control Conference.

3 The representatives from Saskatchewan, Alberta, Manitoba, the Dominion Department of Experimental Farms, the Western States Weed Control Conference, California, Colorado, Montana, and Wyoming, for their interest, attendance, and participation in our conference.

4. The Minnesota State Department of Agriculture, Dairy and Foods, and the University of Minnesota.

5. The radio stations--KSTP, WLOL, WCCO, WTCN, and the North Central Broadcasting System.

6. The St. Paul Pioneer Press and Dispatch, The Minneapolis Morning Tribune, the Minneapolis Evening Times, the Minneapolis Star-Journal, and The Farmer-Webb Publishing Company.

7. Those individuals who planned the Conference.

8. To those persons participating in the program, especially Governor Edward J. Thye, Dr. E. J. Kraus, Dr. E. L. Whitford, and the St. Paul Association.

9. The KSTP Barn Dance Entertainers and the Minneapolis Lion's Club Quartet.

10. The Lowry Hotel for the accommodations provided. (Signed by the full Committee)

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MR. SWENSON: Mr. Chairman, I move the adoption of this Report. Seconded by Dr. Stahler and carried.

REPORT OF THE NOMINATING COMMITTEE, DR. L. M. STAHLER, BUREAU OF PLANT INDUSTRY

Mr. Chairman, and members of the Conference.

This Committee, after canvassing members of the Conference, and after due deliberation, begs to submit the following Resolutions to the Conference:

1. That recognizing the large selection of available executive material represented by the conference delegates, and the burden of executive responsibilities encumbent on elected officers:

That this Conference go on record as favoring in future years, the policy of no officer succeeding himselt to the same, or any other executive position of the Conference.

I move that this Resolution be adopted by this Conference. (Seconded by Mr. Kinch of Nebraska and carried.

2. Recognizing the excellent and thorough job that has been done during the past and critical initial year of our Conference's existence, and recognizing the ability and enthusiasm of our present Executive Body, in further directing our organization, we beg their imposition, and submit the following slate of officers for the North Central States Weed Control Conference for 1946:

PRESIDENT..T. F. Yost
VICE PRESIDENT..Noel S. Hanson
SECRETARY-TREASURER..A. H. Larson

I move the unanimous adoption of this slate of officers.

PRESIDENT YOST: Gentlemen, it is my understanding that there was to be an opportunity to offer nominations from the floor. Are there any nominations from the floor?

MR. KELTNER: I move that the nominations be closed.

MR. KLATT: Seconded the motion.

DR. STAHLER: Put motion and carried unanimously.

PRESIDENT YOST: I don't think the Committee gave much deliberate thought on this slate--but they did do well on the other two men.

I want to assure you that this is no small job. There are a lot of men who could handle this job as President, at least better than I. I certainly did not anticipate that it was as big a job and there was as much work connected with it as there has been. I will say, that we had a wonderful lot of help and cooperation and assistance, from members of the Conference, and we appreciate that. I want to speak for the Vice President, the Secretary-Treasurer and myself. We have certainly had a lot of help and cooperation, and we appreciate that. I think this Conference would have been a failure without the help that we have had throughout the year. I want to mention, especially, the State representatives, who have come through in every case in good shape and given the information that we have asked for. I wouldn't be surprised that they would have more to during the coming year.

I appreciate the confidence that you have placed in me. I think it would be a mistake for the conference to continue to elect the same officers, certainly more than two years. I am speaking for myself, only, as president. I do sincerely believe that the Conference will grow and develop if the officials are changed once in awhile, and I want to make this statement now, that not only do I not choose to run next year, but I will refuse to accept the office next year, so you can be figuring on some other President when we get down to DesMoines next year. I will be glad to give the other officers an opportunity to say anything that they care at this time.

VICE PRESIDENT HANSON: You have spoken for us, Ted, so I am not going to say very much more. I think just a word of explanation is in order. You folks remember

that Dr. Keim of the University of Nebraska was elected as Vice President last year, and when he left to go to Europe as a Professor in the American University there, Mr. Yost and Mr. Larson asked me to serve in his place as vice president. I think that that explanation is in order. I do thank you for your confidence for next year.

SECRETARY-TREASURER LARSON: I believe that Ted expressed the feelings that we had. I know that the Secretary is in a place where a lot of gripes might center, and I appreciate the fact that we have had done of those and everyone has been willing to do his part and would help out whenever the occasion came. I hope that next year will pass off in the same way. I will do whatever I can, I assure you, to help out. We don't want to set up a little autocracy, and that is up to you people to decide. In other words, you folks are going to have an organization big enough to run and as Mr. Ball said, don't put it in the hands of just a few people. Ted has done very well and he has done major work and has been of the big wheels in making this thing go through. It is my pleasure to work with Noel Hanson and Ted Yost.

PRESIDENT YOST: Any further remarks?

MR. BALL: I would like to thank you personally, and all the rest, for the fine time that I have had here and for inviting me for this conference. Regardless of who your officials may be at our meetings, we always have open house, so any of you in that vicinity that would like to attend our meetings are most certainly invited and welcome, in behalf of the Western Weed Conference.

MR. KNOWLES: There are six or more Canadians here and they have asked me to say something in behalf of the Canadians. It is mighty difficult for me to find words to express how we feel at this Conference. I know it is an inspiration to me, and I feel that our weed problem in Canada is big enough, but we haven't got any organization like this. So if we can reciprocate and invite you back to such a Conference in Canada, I know that I am going to be very happy. I am going back with a lot of ideas which I have gotten here, and I know that the others feel exactly the same way. I think we feel that there is a lot to be said here about farmers, who have Canada thistle growing on their neighbor's land, and we don't want you people to feel that we are that kind of neighbor. We are going back feeling that we want to do our best. You know where we are, and we would be very, very delighted to have you come to our institution in the Experimental Farms. You would be exceedingly welcome.

PRESIDENT YOST: Thank you, very much.

MR. KEPHART: May I add one word to this, I have had a personal delusion, at one time, when I was the only man in the United States working with weeds. I want you to know what it means to see a group like this, all very able people, who think that weed control is important enough. I want to say a little more about my feelings in the matter. I want to say that this is certainly an expression of what weeds are coming to mean to the farmers in the United States, and I want to extend an invitation to you to come to some of our meetings.

PRESIDENT YOST: Thank you for that invitation, and I am sure that if any members of this Conference go to Washington, they are going to look up Mr. Kephart.

I would like to say this, about the remarks from Canada. If any of you have an opportunity to go across the State Line, I want to urge you to look up any of the gentlemen that were here, because I know that they will treat you like you would like to be treated. I had the opportunity to be up there a few days last spring, and I felt like I was treated like a King of England. They surely did treat me fine, and I appreciate it a great deal. I hope that some of you will have an opportunity to go over and see some of the weeds over in Canada, and some of the men over there.

I have received word from E. D. Holden, of Wisconsin and Ross Fleetwood of Missouri, who are members of this Conference, expressing regret that they were unable to attend.

PRESIDENT YOST: The motion is in order for adjournment.

DR. WORZELLA: I move that we adjourn. - - Seconded by Dr. Willard and carried.

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Adjournment of the Meeting of the North Central States Weed Control Conference, at 4:45 P.M., November 28, 1945

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